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An Examination of the Relationship between High School Mathematics Teachers' Dispositions and Their Metaphors for Teaching

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AN EXAMINATION OF THE RELATIONSHIP BETWEEN HIGH SCHOOL MATHEMATICS TEACHERS' DISPOSITIONS AND THEIR METAPHORS FOR TEACHING

by

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DEDICATION

This dissertation is dedicated to every teacher and student who has crossed my path and has fueled my desire to learn and to grow as a leader in education.

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ABSTRACT

AN EXAMINATION OF THE RELATIONSHIP BETWEEN

HIGH SCHOOL MATHEMATICS TEACHERS'

DISPOSITIONS AND THEIR METAPHORS FOR TEACHING

By

Lorrie Ogle Bearden

Teachers demonstrating dispositions that lead to effective teaching is a common discourse in mainstream education circles. Consequently, teacher education programs are held accountable for standards that include assessing professional teaching dispositions. In 2008, National Council of Accreditation of Teacher Education (NCATE) published standards in which professional dispositions were clearly defined. Likewise, scholarly work in metaphor research provided an understanding of how teachers conceptualize their most fundamental views and beliefs about teaching. This mixed methods study examined the relationship between the dispositions and the teaching metaphors of mathematics teachers. The sources for this study included interviews, observations, field notes and memos. After extensive data analyses, the findings revealed a link between the professional dispositions and the teaching metaphors of mathematics teachers may exist in teachers' belief systems. Gender differences were found in the dispositions of high school teachers, and three themes emerged under the umbrella of belief systems: (1) personal experiences; (2) perceptions about personal factors (dispositions); and (3) perceptions about their students. One recommendation for teacher practice is to design

professional learning in the area of teaching metaphors. Discovering their metaphors for teaching would provide for reflection on how their teaching metaphor informs many aspects of their teaching. Consequently, the findings impact teacher preparation as well. Exploring the teaching metaphors of preservice teachers would reveal basic beliefs that these students hold with regard to teaching and learning. These initial metaphors, along with exposure to reflective activities and field-based experiences could attribute to factors that would influence their beliefs about teaching.

KEY WORDS: conceptual metaphor theory; metaphors of teaching; teaching dispositions; reflection; preservice teachers; inservice teachers; dispositional instruments; dispositional assessment; mathematics.

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Keep away from people who try to belittle your ambitions. Small people always do that, but the really great make you feel that you, too, can become great. ~*Mark Twain*

CHAPTER 1

INTRODUCTION

Historically, reformers of the American education system have typically focused on student achievement, teacher effectiveness, or both (Cuban, 1993). In 1839, Horace Mann, considered to be the father of American education, during his tenure as Secretary of Education, presided over the establishment of the first normal schools in the United States (Kern, 2006). The primary purpose of normal schools was to educate and to train those who aspired to be teachers. Mann, President Van Buren, as well as other leaders and scholars of this time period believed that the future of this young nation ultimately hinged on several important ideas, one of which was providing the highest quality of education possible for each of its children (Boers, 2007; Dancer, Kior de Alva, Krieger, Wilson, & Woloch, 2006; Kern, 2006). The establishment of normal schools indicated that the leadership of the time understood that preparing highly-qualified teachers was key to affecting students' learning and was fundamental to providing the highest-quality education possible. Throughout history and into the present, educational and governmental leaders have continued to support that same notion that highly-qualified teachers could impact student achievement (Darling-Hammond & Sykes, 2003; Darling-Hammond, 2006; Drame & Pugach, 2010; Elmore, 2000; Harris, & Muijs, 2002; NCLB, 2007).

Empirically, a link exists between teachers who are highly qualified and the achievement of their students (Darling-Hammond & Sykes, 2003; Darling-Hammond, 2006; Drame & Pugach, 2010; Elmore, 2000; Harris, & Muijs, 2002; NCLB, 2007). This

connection prompted a related component of No Child Left Behind (NCLB) known as Title II, or the highly-qualified teacher provision, which makes "funds available to states and other entities under a variety of programs that will assist them in developing and supporting a high-quality teaching force, and thereby improving student academic achievement" (USDOE, 2002, p. 3). Although there are also other key factors affecting student achievement, such as race, socioeconomic status, level of education and involvement of parents, etc., strong evidence shows that effective teaching is beneficial for students and for schools (Darling-Hammond, 2006; Drame & Pugach, 2010).

Since the early 1980s, educational scholars, lawmakers, and lobbyists have more closely examined the link between effective teaching and student achievement. These leaders have used the term **"**dispositions" when referring to how classroom teachers demonstrate alignment with what are considered to be the most effective teaching practices such as: making content meaningful, awareness of the diversity among learners, exhibiting pro-social behaviors, and an enthusiasm for teaching and learning (INTASC, 1992). In its broadest terms, dispositions can be defined as one's individual characteristics or qualities including attitudes, beliefs, interests, and values. In the field of education, many national exams, state licensure programs, accreditation agencies, and other professional organizations emphasize that appropriate dispositions are just as important for effective teaching as knowledge in the content area (Armstine, 1990; Helm, 2006; McNight & Douglas, 2004). Dispositions can be determiners of behavior and are usually the result of personal meanings from which actions and/or reactions are based (Taylor & Wasicsko, 2004; Weiner & Cohen, 2003).

Initially, dispositions of teaching were discussed as a philosophical construct that was based upon the premise that all individuals possess intrapersonal dispositions which are those innate characteristics, values and beliefs that guide and influence their choices, as well as how they interact with others (Elbaz, 1981; Katz & Raths, 1985; Ryan & Deci, 2000). However, over the next 30 years, initiatives such as standards-based teaching have been the driving force of present day education, and the importance of teachers demonstrating dispositions that lead to effective teaching has become more important in mainstream educational circles.

Likewise, the definition of teacher dispositions has evolved into a vague terminology of measurable behaviors (Armstine, 1990; Helm, 2006; McNight & Douglas, 2004, Taylor & Wasicsko, 2004). This evolution is evidenced by changes in the definitions of professional dispositions that have been published by the National Council for Accreditation of Teacher Education (NCATE). In 2001, NCATE defined professional dispositions as the values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities. Moreover, the most recent NCATE (2008) standards asserted that "professional dispositions are the professional attitudes, values, and beliefs *demonstrated* through both verbal and nonverbal behaviors as educators interact with students, families, colleagues, and communities" (pp. 89-90). In 2002, Humphreys and Hyland cautioned that with the examinations of teacher effectiveness and reflective practice there seems to be a tendency to overlook other domains, and they stressed the importance of keeping the emotional and moral aspects of teaching as a part of the discourse of professionalism and dispositions (Humphreys & Hyland, 2002).

A critical review of the literature has also revealed an increased interest in metaphor research as a way to better understand teachers' conceptualization of all aspects of teaching: instructional preparation, schooling, students, and curriculum (Martinez, Sauleda, & Huber, 2001; Saban, Koebeker, & Saban, 2007). Mahilios, Massengill-Shaw, and Barry (2010) define metaphor as "analogic devices that lie beneath the surface of a person's awareness and serve as a means for framing and defining experiences" (p. 49). As an extension, human beings use words, images, symbols, and gestures to interact with and to interpret experiences, life, work, and their sense of being. Lakoff and Johnson's (1980) book, *Metaphors We Live By*, was centered on the idea that because human beings conceptualize and comprehend their life experiences through metaphors that framed their personal attitudes and beliefs, teachers' metaphors would strongly influence their attitudes and beliefs about teaching. This new theory revealed in *Metaphors We Live By* (1980) prompted other researchers to explore how metaphors might explain how teachers form attitudes and beliefs not only about their classroom practices, but how they feel about their profession in general (Mahilios et al., 2010; Martinez et al., 2001; Saban et al., 2007).

Statement of the Problem

Teacher education programs are held accountable for standards regarding preservice teachers that include professional teaching dispositions. Because inservice teachers are not necessarily held to the same standards as preservice teachers, newly certified teachers are likely to join faculties who are not exposed to recent research-based best practices, and within a short amount of time, the newly-certified teacher begins to adopt the instructional practices in which he or she is surrounded (Coke, 2005; Darling-

Hammond & Sykes, 2003). With so much emphasis on assessing the professional dispositions of preservice teachers and given the established link between certain dispositions and effective teaching, it seems logical that the dispositions of inservice teachers should be assessed as well. Sexton (2004) posited that the beliefs, ideas, and values of preservice teachers inform their role as a teacher and their teaching practice. Research has confirmed that teaching metaphors influence teachers' most basic attitudes and beliefs, or their dispositions, regarding many aspects of teaching (Evans & Pourcel, 2009; Mahlios, Massengill-Shaw, & Barry, 2010; Martinez et al., 2001; Noyes, 2006; Richlin, 2006), and in recent decades, there has been a significant amount of research devoted to discovering how preservice and inservice teachers' metaphorical images of teaching and learning inform how they conceptualize themselves as educators (Crick, 2007; Lakoff & Johnson, 1999; Leavy, McSorley, & Bote, 2007; Mahlios et al., 2010; Sexton, 2004; Yob, 2003; Yung, 2001). As a result, research is needed to examine the connection between the dispositions of inservice teachers to their teaching metaphors.

Purpose and Significance of the Study

The purpose of this research is two-fold: (a) to determine if there is any variation in the dispositions of teachers in four domains: content area, gender, age, and years of experience; and, (b) to examine if there is a link between an inservice teacher's metaphor of teaching and his or her professional dispositions. Due to program requirements, the researcher focused on high school mathematics teachers.

Dispositions

Literature on teacher effectiveness, revealed strong evidence that certain dispositions are exhibited by effective and successful teachers, even though definitions

and theoretical constructs of dispositions are often vague (Armstine, 1990; Helm, 2006; Levin & Ye, 2008; Wayda & Lund, 2005). Most individuals possess intrapersonal dispositions, those innate characteristics, values, and beliefs that guide and influence their life choices, as well as how they interact with others (Ryan & Deci, 2000). However, dispositions specific to teaching are also often based on many other factors including, childhood experiences, family background, personal and social experiences, moral and/or religious beliefs and values, as well as experiences during his or her teacher education program (Levin & Ye, 2008; Su, 1992). Because preservice teachers enter university programs with a system of educational beliefs and values based on their unique socialization experiences, teacher education programs benefit from assessing these preexisting beliefs and values (Armstine, 1990; Butler, 2001; Giovannelli, 2003; Helm, 2006; Levin & Ye, 2008; Wayda & Lund, 2005). Bullough (2010) argued that teacher education would benefit from knowing preexisting beliefs of preservice teacher in that this could guide how teacher education is able to stretch, or challenge, preexisting beliefs as a way to enable the preservice teacher into negotiate, or renegotiate, his or her experiences in order to gain self-understanding. Preexisting beliefs and values can also provide insight on the future goals of preservice teachers which could help guide teacher education in developing the experiences that are encountered during the course of the preservice teacher's training to enter the field of education as a practitioner.

For the past few decades, dispositions, beliefs, practical knowledge, and ideals have been used analogously to describe an orientation towards students and the teaching profession that forms the basis of teacher thought and actions (Burant, Chubbock & Whipp, 2007; Giovannelli, 2003; Helm, 2006; Levin, 2008; Phillip, 2007; Su, 1992;

Wayda & Lund, 2005). Through assessing preservice teachers' dispositions, university programs gain powerful insight into their preservice teachers' conceptual ideas about teaching. Teacher educators expose preservice teachers to educational beliefs and values that may or may not align with their preexisting beliefs. The intent is to facilitate the forming of their pedagogy through coursework, observations, interactions and other experiences, all framed within educational best practices (Gay & Kipchoge, 2003; Giovannelli, 2003; Helm, 2006; Levin & Yeh, 2008; Su, 1992; Wayda & Lund, 2005). Assessment instruments are based on teacher's dispositional stances. The behaviors, attitudes, and beliefs that characterize a teacher's dispositional stance will generally fall into one of two areas: professionalism and curriculum (teacher-centered) or student-centered (Rike & Sharp, 2008; Schulte, Edick, Edwards, & Mackiel, 2005). A teacher in a teacher-centered stance could be described as a teacher who values the content and curricular aspects of teaching. The teacher is the authority and the model of the instruction and the students are the recipients of the knowledge. Often in teacher-centered instruction, the student is a passive learner. Having a student-centered stance could be described as a teacher who values the aspects of teaching that are directly related to dealing with the students, which includes the decision-making and the organization of the content. Student-centered instruction requires that the students be actively involved, and working as responsible participants in their own learning (Schulte et al., 2005).

Logically, assessing the dispositions of inservice teachers should provide the same insights to those who develop and coordinate professional development at the K-12 level. There is evidence that there are dispositions which indicate and/or predict effective teaching and that effective teaching is the best way to positively impact student

achievement. Therefore, professional development that supports effective teaching in the classroom should also address dispositions (Burant et al., 2007; Gay & Kipchoge, 2003; Giovannelli, 2003; Helm, 2006; Levin, 2008; Su, 1992; Wayda & Lund, 2005).

Researchers such as Martinez et al. (2001) and Saban et al. (2007) have stated that teachers have explicit beliefs about students and classrooms, as well as concrete images of themselves as teachers; and, that such conceptual beliefs control not only how they think and act during teaching, but also how they interpret the curriculum of teaching as well. Wenzlaff (1998) pointed out that there are two components to a classroom teacher's core curriculum: the formal process which includes materials, lesson plans, and objectives; and the informal which includes classroom environment and attitudes about learning. She discussed how, in excellent teachers, the basic "desirable" dispositions, common to most teachers, will evolve into a belief system that causes the teacher to strongly believe that he or she is not just a cog in the educational process but someone whose teaching exhibits a passion for promoting their students' educational success.

Conceptual Metaphor

In the past two decades, a growing body of literature in metaphor research has provided a better understanding of how teachers conceptualize their most fundamental views about schooling, teaching, curriculum, and interacting with students (Martinez et al., 2001; Saban et al., 2007). Lakoff and Johnson (1980), in their publication, *Metaphors We Live By*, formulated the idea that metaphors offer a compelling, basic way for people to conceptualize and ultimately come to understand their various life experiences.

According to research, conceptual metaphors provide us with a means to understand one domain of experience in terms of another. For instance, the saying "time

is money" is a metaphor and many of the words that are commonly associated with money (i.e., cost, save, give, spend, buy, waste, etc.) can, by extension of the metaphor, also be associated with time. The use of conceptual metaphors allows humans to deal with relatively unfamiliar, more abstract domains of experience in a familiar, tangible way. Metaphors not only allow for the expression of ideas through language, but also through thought (Geary, 2011, Hong-mei, 2010). Metaphor is a common language phenomenon and the structure of the metaphor may be universal or can vary from culture to culture. Consequently, it is important to use caution in researching conceptual metaphors in cross-cultural situations (Lakoff & Johnson, 1980; Hong-mei, 2010).

The purpose of this study was to determine what variations or differences exist in the dispositions of secondary level inservice teachers, specifically in four domains: gender, years of experience, age, and content area. Also, this study explored the relationship between mathematics teachers' metaphor for teaching and their professional dispositions. This two-phased study utilized quantitative and qualitative measures to generate findings regarding the dispositions of inservice teachers, as well as to explore teaching metaphors of inservice, mathematics teachers. During the study, the researcher employed an instrument designed to assess dispositions, semi-structured interviews, focus group discussion, classroom observations, member checking, and the researcher's memos and field notes.

Research Questions

The following research questions guided the current study.

Question 1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus professional, curriculum-centered stances?

Question 2: Are there significant differences in the dispositions of inservice teachers based on gender? If so, what are the differences?

Question 3: Are there significant differences between the dispositions of teachers based on years of experience? If so, what are the differences?

Question 4: Are there significant differences between the dispositions of teachers based on their age? If so, what are the differences?

Question 5: Are there significant differences between the differences of mathematics teachers and other content areas? If so, what are the differences?

Question 6: What are mathematics teachers' metaphors of teaching, and what is the connection between their metaphors and their dispositions?

Question 6.1: What are the differences in mathematics teachers' metaphors for teaching and their dispositions when considering differing demographics of gender, years of experience, age, and/or highest earned degree?

Question 6.2: What is the relationship between mathematics teachers' expressed teaching metaphors and their instructional practices or models?

Table 1.1. Summary of research questions and how each will be examined.

Quantitative Questions:	**Hypotheses**	**Independent Variable**	**Dependent Variable**	**Analyses**
Q1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus professional, curriculum-centered stances?	Literature indicates that dispositions of teachers will fall into one of two categories: perceptions that are centered in professionalism and curriculum (teacher-centered), or perceptions that are student-centered. Survey research using the Teacher Dispositions Index instrument will reveal the dispositions of the teachers, and variations between dispositions based on five demographic domains.	None	None	Cronbachs alpha
Q2: Are there significant differences in the teachers' dispositions based on gender?	**H2:** Yes, mean differences in the dispositions of teachers dependent on their gender will be found, with females scoring higher in student-centered dispositions.	Gender	Disposition subscale scores	*t*-tests
Q3: Are there significant differences between the teachers' dispositions of teachers based on years of experience?	**H3:** Yes, mean differences in the dispositions of teachers dependent on their years of experience will be found, with less experienced teachers scoring higher in student-centered dispositions.	Years of Experience	Disposition subscale scores	*ANOVA*, with post hoc analyses
Q4: Are there significant differences between the teachers' dispositions of teachers based on their age?	**H4:** Yes, mean differences in the dispositions of teachers dependent on their ages will be found with younger teachers scoring higher in student-centered dispositions.	Age	Disposition subscale scores	*ANOVA* with post hoc analyses
Q5: Are there significant differences between the differences of	**H5:** Yes, mean differences in the dispositions of teachers will be found between mathematics	Content area	Disposition subscale scores	*ANOVA* with post hoc analyses

mathematics teachers and other content areas?	teachers and other content area teachers, with other content areas scoring higher in student-centered dispositions.			
Qualitative Questions				
For the qualitative phase of this study, dispositions are defined to be the affect of a teacher—attitudes, values, and beliefs that may or may not influence how he or she applies and/or uses knowledge or skills in his or her teaching. Literature on the metaphors of teaching describes how conceptualization of metaphors can influence teachers' attitudes, belief system, and their approaches to teaching, curriculum, and interactions with students. Using semi-structured interviews, participant observations, and a focus group discussion, data was collected from four mathematics teachers of different genders, ages, years of experience, and degree earned using digital audio and video devices. Data was collected, coded, and analyzed for themes that emerge. The analyzed data was used to inform the following research questions:				
Q6: What are mathematics teachers' metaphors of teaching, and what is the connection between their metaphors and dispositions?				
Q6.1: What are the differences in mathematics teachers' metaphors and dispositions when considering differing demographics of gender, age, years of experience, and/or highest earned degree?				
Q6.2: What is the relationship between mathematics teachers' expressed metaphors and their instructional practices or models?				

Definition of Terms

The following terms are defined given the specific examination of this study.

Disposition: In this study, disposition was used to mean the affect of a teacher—attitudes, values, and beliefs that may or may not influence how he or she applies and/or uses knowledge or skills in his or her teaching.

Preservice teacher: A person who is enrolled in a teacher education program, but has not fulfilled the graduation and/or certification requirements of the university and/or state of residency in order to teach.

Inservice teacher: A person who is currently employed as a classroom teacher at any level of education.

Metaphor: For this study, the definition of metaphor provided by Saban et al. (2010) was used: "analogic devices that lie beneath the surface of a person's awareness and serve as a means for framing and defining experiences (p. 49).

Methodology Preview

The study was conducted in two phases. A mixed-model research design was employed using a survey instrument, interview methods, and observations. The survey instrument was used in phase one to gather demographic data, to assess the dispositions of the participants, and to provide participants an opportunity to reflect on three open-ended questions. The surveys were distributed using an online survey program. During phase two, qualitative data were collected using two types of interviews: a semi-structured interview, classroom observations, and a focus group discussion. Initially, four participants, who teach mathematics, were asked to participate in semi-structured individual interviews. After each interview, the participant was observed teaching in his or her classroom. The final data were collected during a focus group interview. In the individual and focus group interviews, the four participants discussed their thoughts regarding their teacher dispositions and their metaphors for teaching. The four participants were mathematics teachers who completed the survey instrument and were selected using a purposeful sampling that was designed to maximize variation. All data were stored on an external hard drive and a flash drive, both of which were password protected.

Overview of Results

Although the results will be discussed in more detail in chapters four and five, a brief summary is provided here. In the quantitative phase one, gender differences were

found on the student-centered subscale with the female teachers scoring higher. This would seem to indicate that female teachers hold a more student-centered stance. In the qualitative phase two, three themes emerged from the data. The first theme that emerged was personal factors that led the participants to teaching. Even though each participant told a different story of how he or she chose teaching as a career, each one did have past experiences that he or she felt had led him or her to become a teacher. The second theme to emerge was the personal factors that have impacted each participant's teaching. It is noteworthy that each one discussed in detail an emphasis on: (1) effective teaching strategies; (2) planning and preparation; (3) reflective teaching; and (4) evaluating feedback. Finally, the third theme which emerged was how each participant's perception of his or her students shaped his or her teaching. The qualitative themes in phase two supported the findings from the quantitative phase one research in which the dispositional stance of the participants was identified.

Summary

This chapter presented an introduction and the background for the study on assessing the dispositions of secondary inservice teachers and how different mathematics teachers' metaphor of teaching can impact their dispositions. It also provided the statement of the problem, as well as the purpose and significance of this study. Research questions were posed; a matrix was included that provided information and discussion with regards to the quantitative and qualitative aspects of this study; a preview of the methodology was discussed, and definitions of key terms were also included. Finally, a brief, overview of the results was discussed.

CHAPTER 2

Theoretical Framework

The purpose of this study was to explore the relationship between professional dispositions and the teaching metaphors of high school mathematics teachers. In order to explore the relationship between dispositions and teaching metaphors, this study utilized two phases of research, using both quantitative and qualitative methods.

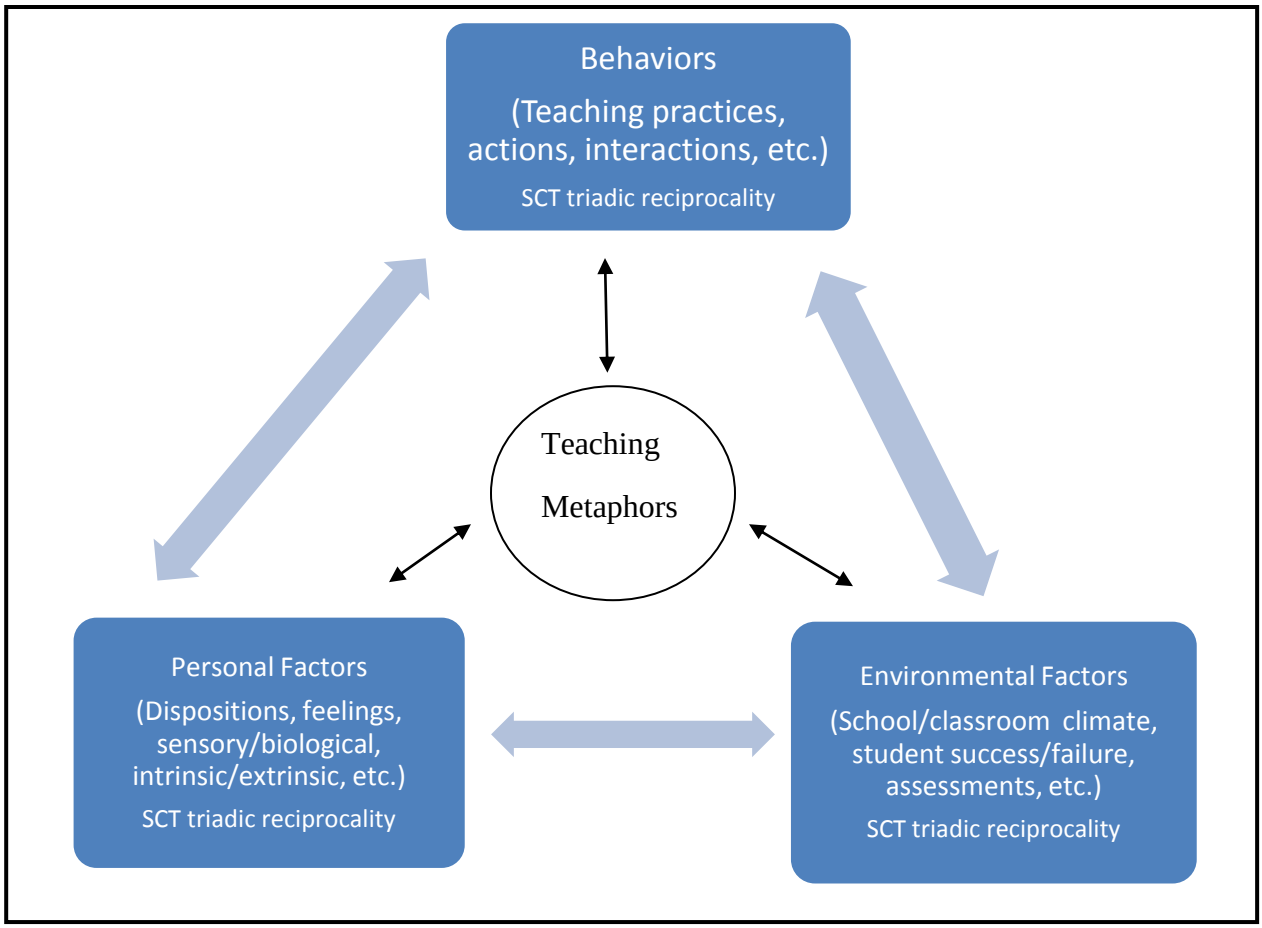
Bandura's (1986) Social Cognitive Theory (SCT) provided the primary framework for the study of the mathematics teacher's dispositions, and Lakoff and Johnsons's (1980) Conceptual Metaphor Theory (CMT) provided a complementary lens for how a teachers' teaching metaphor influences their understanding of and actions related to teaching practices. These practices include but are not limited to, one's basic views of teaching, one's interactions with students, colleagues, or others, one's instructional efficacy, and their teaching outcomes and goals. Together, these theories and how they related to one another provided the framework for the study.

Social Cognitive Theory provides one way of understanding the complexity of teaching. Personal, environmental, and behavioral factors influence teaching practice. Through the process of reflection, teachers judge or make decisions about their instructional efficacy (personal factors). They interpret, and consider factors such as students' responses (environmental), successes and failures when making decisions. They adjust or continue their own actions, words, activity (behaviors), which in turn, impact student behavior and performance (environmental factor). Social cognitivists refer to this process as "reciprocal determinism" (Bandura, 1986, 1997; Schunk, 2011).

Research indicated that teacher candidates enter higher education with established teaching dispositions (Arnstine, 1990; Elbaz, 1981; Katz & Raths, 1985; Ryan & Deci, 2000). These dispositions have been found to frame the teacher candidates' initial teaching metaphors, whether they realize it or not (Mahlios et al., 2009; Martinez et al., 2001; Saban et al., 2007). From the perspective of SCT, dispositions are considered personal factors.

Likewise, Conceptual Metaphor Theory (CMT) provides insight into how teaching metaphors assist a teacher in making meaning of his or her teaching (Mahlios et al., 2009; Martinez et al., 2001; Saban et al., 2007). Lakoff and Johnson (1980) established how metaphors structure human thought and knowledge and how they are grounded deeply in physical experiences. The processes and factors which shape the teaching metaphors can be compared to SCT in that similar factors shape metaphors and the process is circular in nature. Figure 2.1 provides a graphical representation of how Social Cognitive Theory, teaching metaphors, and dispositions relate to inform the study.

Figure 2.1. The symbiotic relationship of SCT and the formation of the teaching metaphor.



Social Cognitive Theory

SCT is based on the central premises that learning is accomplished by observing and interacting with others in a social context (Bandura, 1986, 1997; Schunk, 2011). With origins in psychology, Bandura (1986) theorized that human behaviors are learned through observing the actions of others, through interacting with the environment, and through basic cognitions. Social cognitivists posited that a person's way of thinking can be influenced by factors such as personal experience, behaviors that he or she witnessed, and that his or her environment can also influence future behaviors (Bandura, 1997; Schunk, 2011). SCT emphasizes that an individual's cognition plays a crucial part in his

or her capacity to encode information, to construct meaning about reality, to self-regulate, to self-reflect, and to perform behaviors (Bandura, 1986, 1997; Pajares, 2002).

Theorists in SCT advanced a view of human agency in which people are self-reflecting, self-regulating, intentional, and proactive within their environment, and that people learn through a dynamic combination of personal, environmental, and behavioral influences. This trio of interplay is referred to as triadic reciprocality (see figure 2.1) and is the key to the concept of reciprocal determinism (Bandura, 1986, 1997; Schunk, 2011). The term reciprocal determinism infers that the factors that influence learned behaviors are not mutually exclusive, but rather that these factors have reciprocity. For instance, a teacher can work to change his or her students' negative self-beliefs about their ability to be successful in mathematics (personal factors), to improve their students' study habits and self-regulatory practices (behaviors), and to alter their classroom and/or learning structures that may undermine student success (environmental factors). It is important to note that the reciprocity of the three factors does not imply that there is symmetry in strength and/or influence that any one factor has on either of the other two (Bandura, 1986, 1997; Schunk, 2011).

In SCT, learning is defined as a process of acquiring or modifying knowledge or skills, or the modification of behaviors and, according to Schunk (2011), learning is accomplished either enactively or vicariously. Enactive learning occurs when the individual actually does or participates in an activity, and vicarious learning occurs when the individual observes a skill, behavior, through modeling (e.g., live, electronically, symbolically, etc.). SCT emphasizes that both ways of learning involve behavioral consequences that serve as sources of information and motivation. For example, an art

teacher giving each student a lump of clay and instructing them to mold the clay into an animal would be an example of enactive learning. On the other hand, having the students gather around to watch as the teacher models using a clay wheel to mold a vase would be an example of the students learning vicariously. Modeling is a key component in SCT, as Bandura (1986) proved that observation of modeling may result in changes that are behavioral, cognitive, or affective. However, it is important to note that neither enactive nor vicarious learning guarantees that learning will occur, or that behavior changes will occur (Bandura, 1986, 1997; Pajares, 2002; Schunk, 2011).

Self-efficacy. There are variables that affect observational learning and the performance of the learned behaviors, like the observer's goals or goal setting; the observer's self-efficacy; and, the observer's outcome expectations. SCT affords that much of human behavior is sustainable over long periods of time due to goal setting, self-efficacy, and the self-evaluation of progress. Schunk (2011) stated that goals and goal setting are addressed in SCT by outlining some properties of goals and their effect on behavior. The three main properties of goals are: specificity (or how specific a goal is), proximity (how far into the future a goal is projected), and difficulty (the degree of challenge and attainability). SCT emphasizes that setting goals and anticipating the outcome of achieving those goals is a feature of human agency that serves to guide and motivate individual efforts; and, that all three goal properties are important in determining the degree to which self-efficacy is gained or lost (Bandura, 1986, 1997; Schunk, 2011).

Self-efficacy is a relevant component of SCT when studying teachers. Bandura (1986) outlined how an individual's self-efficacy, or beliefs about themselves, allows

them to influence their own feelings, thoughts, and behaviors. In SCT, promoting a sense of agency in an individual that he or she can influence his or her lives requires that the individual has a strong sense of self-efficacy (Schunk, 2011). Efficacy is not always just based on a measure of one's skills, but also on what one believes about his or her ability to use his or her skills to achieve success in a given area and/or under certain circumstances.

Efficacy in terms of teachers' self-perceived ability to help students to learn is known as *instructional efficacy.* Instructional efficacy should impact teachers' efforts, persistence, planning, goals, and outcome expectations (Schunk, 2011). When faced with obstacles or demanding situations, such as classroom teaching, Bandura (1997) theorized that the strength of efficacious beliefs sway a teacher's effort, perseverance, resilience, and might even predict the amount of and the type of stress felt. For example, a mathematics teacher with low efficacy (personal factor) in his or her ability to teach calculus may choose to take an online class (behavior) in order to strengthen his or her skills and knowledge before attempting to teach a calculus class. Instructional efficacy and outcome expectations are distinct concepts, yet they are related. After completing the online class, a mathematics teacher may have high efficacy in his or her ability to teach calculus, yet expect that his or her students will not master the concepts (outcome expectation).

Bandura (1986) expanded the concept of "human agency" to that of "collective agency", and, therefore, self-efficacy is also a social construct. Teachers are a part of a collective agency that includes colleagues, students, staff, administration, and other stakeholders. The collective agency can combine to work together based on shared

beliefs, common aspirations, common goals, and common expected outcomes. The collective efficacy would be the group's shared belief in its ability to set and attain goals in an instructional and educational context (Pajares, 2002). For example, school faculties can develop a sense of collective efficacy based on beliefs about their students' capabilities to learn, their teachers' abilities to teach, their administrators' abilities to create environments that sustain learning and achievement, and their policy makers inclination to create policies that are conducive to all of these activities.

Self-regulation. According to Bandura (1986), individuals also have self-regulatory mechanisms. Being able to self-regulate one's own actions and behaviors involves self-observation, monitoring, and judging through the lens of the belief one has about himself. Individuals possess beliefs, among other personal factors, that enable them to exercise control over their feelings, actions, and thoughts, or in other words, "what people think, believe, and feel affects how they behave" (Bandura, p. 25) and these beliefs are created by personal, environmental, and social factors. Self-regulation involves self-monitoring, self-judgment, and self-reaction (Bandura, 1986, 1997; Schunk, 2011). Schunk (2011) emphasizes that effective self-regulation requires goal setting and progress monitoring, and he posited that self-regulation can be learned. Like efficacy, self-regulation is a function of human agency that can occur collectively. Teachers who collaborate can foster goal setting, outcome expectations, and other self-regulatory skills (Schunk, 2011).

Conceptual Metaphor Theory (CMT)

Lakoff and Johnson (1980) initially developed Conceptual Metaphor Theory (CMT), the complementary framework for this study. These researchers defined

conceptual metaphors as "understanding and experiencing one kind of thing in terms of another'' (p. 5). Nunez and Lakoff (2005) further explained how a conceptual metaphor is "a cross-domain mapping … from one conceptual domain to another, where inferences from the source domain are mapped to the target domain" (p. 10). More simply put, CMT describes how metaphor is a conceptual or cognitive device which provides a concrete way for individuals to understand life experiences (Fernandez, 2008; Katz & Law, 2010; Lakoff & Johnson, 1999). Furthermore, researchers have posited that conceptual metaphors provide insight into the basic, tacit ideas that teachers have regarding their teaching (Martinez et al., 2001; Saban et al., 2007; Sexton, 2004). This study's focus is on how a teacher's metaphor of teaching is directly related to that teacher's dispositions, and, therefore, his or her belief systems.

Linguistic metaphor. According to Kinsella, Feldman, Stump, Carroll, and Wilson (2004), "A metaphor is a figure of speech when one thing is spoken about as if it were something else…Through this identification of dissimilar things, a comparison is suggested or implied" (p. R14), which differs from a simile which relies on either the word "like" or "as" to suggest a comparison. For example, one might say "He is a walking encyclopedia." This sentence is a metaphor which compares a person to an encyclopedia. This metaphor is not intended to imply that an encyclopedia has human qualities; however, it does suggest that the man is probably known to have a wealth of information about several different topics, in the same way an encyclopedia contains a wealth of information about several different topics. Metaphors are often extended. Extended metaphors are found in literary works such as novels, songs, and poems. They consist of a main subject of a comparison, and secondary subjects that have some

relationship with the main subject (Kinsella et al, 2004). For instance, in the play *As You Like It,* Shakespeare (1623) wrote the line "All the world's a stage, and all the men and women merely players." This extended metaphor describes life as a play, in which the world is its stage, and the extension comes when he indicated that the people in the world are the actors playing their parts on the stage or in the world. Likewise, metaphors that are used to describe teaching can be extended to describe the main subject (teaching), and the secondary subjects (students, resources, goals, barriers, etc.) in terms of another domain that makes sense within the teacher's belief system (Lakoff, 1998; Leavy et al., 2007; Martinez et al., 2001; Noyes, 2006).

Conceptual metaphor. Conceptual metaphors are built on linguistic metaphors, but incorporate internal beliefs and values which help individuals to make sense of both physical and emotional experiences (Geary, 2011; Hong-mei, 2010; Thayer-Bacon, 2003). In 1993, Lakoff wrote, "the system of conventional conceptual metaphor is mostly unconscious, automatic, and used with no noticeable effort" (p. 245). Exploring conceptual metaphors is not just about the language of the metaphor, but also of the unconscious thought processes and reasons that causes the metaphor to make sense of the experience when mapping from one domain to the other.

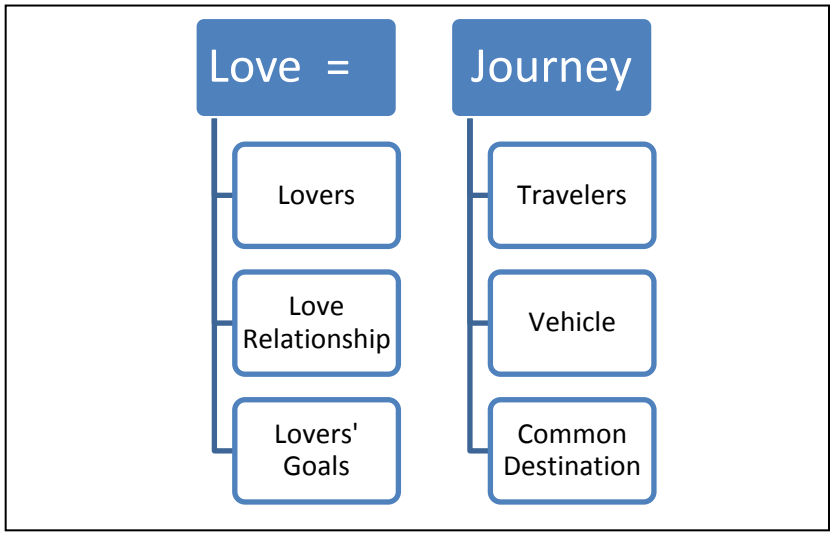
Lakoff and Johnson (1980) established that, although conceptual metaphors can be ideological, they are deeply grounded in physical experiences and structure human thought. Deignan (2005) stated that conceptual metaphor is "central to thought, and therefore to language" (p. 13) and that conceptual metaphors are typically a shared part of the cultural language. Conceptual metaphors are systematic in that they provide a structure for understanding one domain in terms of another. For example, Lakoff and

Johnson (1980) use the conceptual metaphor "TIME IS MONEY" (p. 7) to illustrate how a conceptual metaphor can be conventionalized in language. "You are wasting my time," This will save you hours," "I don't have the time to give you," That flat tire cost me an hour," and "Thank you for giving your time," are just a few of the phrases that are commonplace in language and communicate that time is a resource and a valuable commodity. In the American culture, time and money are both categorized conceptually as being a limited and valuable resource, which is why so many of the expressions in our language can be used to refer to time and to money. Americans spend, waste, run out of, and save both time and money. Although this metaphor makes sense in American culture, it may not be meaningful to another country's culture (Deignan, 2005). Similarly, teaching has its own culture, and therefore, its own metaphors.

Teaching metaphors. Recently, CMT has been used as a grounding framework for researchers and teacher educators who seek to understand how teachers conceptualize their most basic beliefs and values about teaching and learning. Many researchers have framed studies using CMT and have contributed to a growing body of evidence that suggests teachers' metaphorical imagery of the process of teaching provides an understanding of how they see themselves as teachers, as well as how they go about embedding the teaching metaphors in their work (Martinez et al., 2001; Noyes, 2006; Saban et al., 2007; Sexton, 2004). In other words, teachers' beliefs about teaching shape their metaphor for teaching. In their book, *Metaphors We Live By,* Lakoff and Johnson (1980) used the example of "life is a journey" as another illustration of a conceptual metaphor. Lakoff (1997) used the "life is journey" to illustrate how "a set of ontological

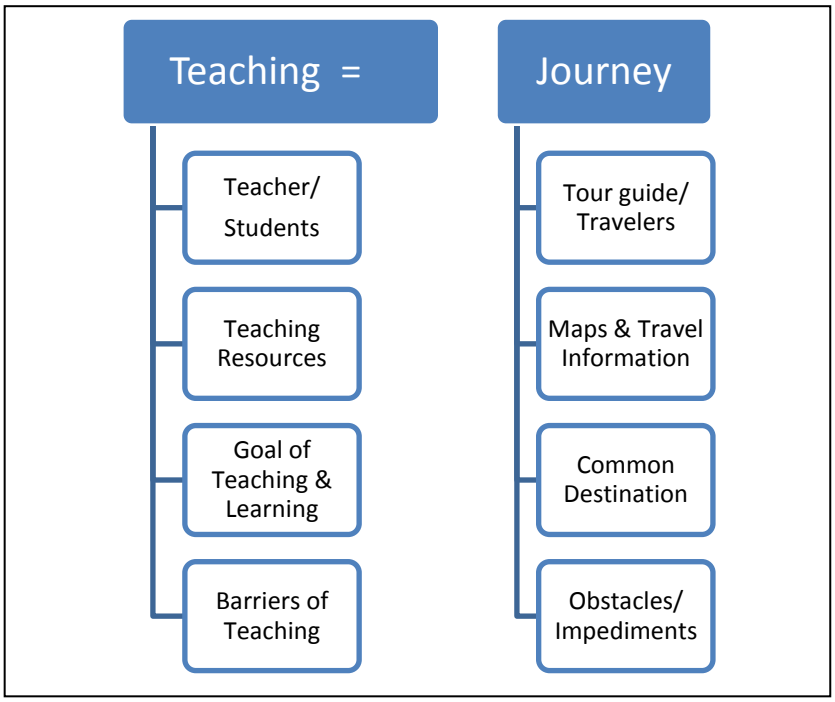
correspondences" (p. 207) would characterize a mapping of the ontology of life onto the ontology of love thereby extending the metaphor, as illustrated in figure 2.2.

Figure 2.2. Ontological mapping of a conceptual target-domain (Love) onto source-domain (Journey).



This metaphor could also be applied to teaching. Using the framework of CMT, if teaching were conceptualized as a journey ("teaching is journey"), the teacher understands teaching (target domain) in terms of a different source domain (a journey). The conceptual mapping permits the teacher to transfer his or her knowledge and experiences in teaching to his or her knowledge and experiences of a journey. The teacher may see himself or herself as the tour guide, his or her students might be considered the travelers on the journey, and perhaps, the goal of learning may be seen as the destination. The journey's success or failure might even be measured along the way by the side trips, road blocks encountered, costs, meaningful experiences, or the distance travelled. Figure 2.3 records the ontological mapping of Teaching is Journey, or Teaching as Journey.

Figure 2.3. Ontological mapping of teaching metaphor: Teaching is a Journey.



In the same context that all people use conceptual metaphors to make meaning of life events, exploring metaphors of teaching can help make meaning of teaching events such as interactions between teachers and children, selection of instructional strategies, or what is worth teaching or knowing. (Martinez et al., 2001; Saban et al., 2007; Sexton, 2004). According to Saban et al. (2010), metaphors can be used as tools to gain insight into preservice teachers' beliefs regarding their life and work. Also, researchers indicate that metaphors can function to make implicit knowledge explicit (Martinez et al., 2001; Saban et al., 2007) and to provide a language to ''bridge the gap between theory and practice'' (Mostert, 1992, p. 19). Connelly, Clendenin, and He (1997) concluded that teachers' metaphors function as a vehicle which allows teachers to examine their assumptions or preconceived notions about teaching and to ''explore hidden intellectual avenues contained in a metaphor's frame'' (p. 671). Thus, teaching metaphors provide a

basis for understanding the beliefs or dispositions a teacher may hold about teaching, learning, students and related classroom events.

REVIEW OF THE LITERATURE

Professional Dispositions of Teaching

With a focus on dispositions, synthesis of the literature from the 1950s to the present shows that dispositions, efficacy, beliefs, practical knowledge, and ideas about teaching practice are, at times, used anagolously to describe an orientation toward students and the profession. Ambiguity of the term and competing perspectives of how to define dispositions has prompted some researchers to declare that the term *disposition* should be removed from educational lexicon regarding professional standards of teaching (Burant et al., 2007). However, the majority of the research indicates that teacher dispositions forms the basis of teachers' thoughts and actions which are essential for teaching excellence (Giovannelli, 2003; Helm, 2006; Levin, 2008; Phillips, 2007; Su, 1992; Wayda & Lund, 2005), and empirical evidence indicates that effective teaching is the best way to positively impact student achievement (Albee & Piveral, 2003; Giovannelli, 2003; Helm, 2006; Levin & He, 2008; Wayda & Lund, 2005; Whitsett, Roberson, Julian, & Beckham, 2007).

Historical Context of Teacher Dispositions

Research on teaching dispositions began to surface in the 1950s. In 1957, Arthur Combs conducted a series of studies to determine the differences in a teacher who is effective versus an ineffective one. His research yielded "five categories of perceptions that can serve to differentiate effective from ineffective educators: (1) perceptions about subject matter; (2) perceptions about self; (3) perceptions about other people; (4)

perceptions about the teaching task; and (5) general frame of reference." (Whitsett et al., 2007, p. 96). Later, Combs (1972) concluded that because the five categories of perceptions could be linked to effective teaching, that teacher education programs' goal should be in the production of teacher candidates who would become effective teachers. Much of the research on teacher dispositions over the next 30 years is grounded on the Combs' research (Katz & Raths, 1985; Whitsett et. al., 2007).

A teacher's instruction is guided by his or her beliefs and attitudes about teaching, students, and the role of teacher (Furinghetti, 2007). Since the mid-1980s, educational scholars, lawmakers, and lobbyists have used the term "professional disposition" or "practical knowledge" when referring to how classroom teachers demonstrate alignment with what are considered to be best teaching practices. These included, but are not limited to: making learning meaningful; having a strong knowledge of content; being aware of the diversity among learners; and exhibiting an enthusiasm for teaching and learning (Arnstine, 1990; Katz & Raths, 1985; Ryan & Deci, 2000). Initially, the connection between effective teaching and professional dispositions was discussed as a philosophical construct that was based upon the premise that all individuals possess intrapersonal, innate characteristics, values, and beliefs that guide and influence their choices, as well as how they interact with others (Arnstine, 1990; Elbaz, 1981; Katz & Raths, 1985; Ryan & Deci, 2000). Over the past two decades, scholars have emphasized that appropriate dispositions are just as important for effective teaching as content knowledge. In a quantitative study, Giovannelli (2003) demonstrated that a reflective disposition in teacher candidates was related to their teaching effectiveness as rated by their university supervisors. Helm (2006) argued that not only are teaching

dispositions important, but that dispositions should be assessed at the university level for all teacher candidates. Levin and He (2008) qualitatively studied 94 teacher candidates enrolled in a graduate level teaching courses and determined that the dispositions of teachers that will drive the classroom decision making, both instructionally and pedagogically, will also impact student opportunities for learning.

Over the years, the notion of professional dispositions has taken on a larger role in mainstream educational circles, and the definition has evolved into a vague terminology of measurable behaviors (Arnstine, 1990; Helm, 2006; McNight & Douglas, 2004). This change is also evidenced by the emphasis on professional dispositions that have been published in the NCATE Standards, the Interstate New Teachers Assessment and Support Consortium (INTASC) Ten Principles, and the National Board of Professional Teacher Standards (NBPTS) Five Core Propositions; all of which are known nationally for assessing classroom teachers at different phases: as teacher candidates prepare to work in schools, as newly-certified, novice teachers, and as experienced teachers, respectively (INTASC, 1992; NBPTS, 2008; NCATE, 2001).

In 2001, NCATE defined professional dispositions as the values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities; however, the most recent NCATE (2008) standards posited that "professional dispositions are the professional attitudes, values, and beliefs demonstrated through both verbal and nonverbal behaviors as educators interact with students, families, colleagues, and communities" (pp. 89-90). In its first standard, NCATE outlined that teacher candidates should have knowledge of and be able to demonstrate various knowledge and skill sets, including professional dispositions, which are considered

necessary to ensure that all children learn. Although the standard is broad, the expectation is clear. Universities with teacher education programs are charged to identify, define, and operationalize professional teaching dispositions for candidates during their preparation, based on the institution's mission and conceptual framework. NCATE further mandated that these programs should assess candidates based upon a rubric of unacceptable, acceptable, and target levels of proficiencies. Professional dispositions that institutions are specifically expected to assess which are also addressed by NBPTS are: demonstrating the pedagogical and professional knowledge to teach effectively; creating a learning environment wherein students are treated equitably; and acting on the belief that all students can learn (NBPTS, 2008; NCATE, 2008). NCATE's conceptualization of teaching dispositions prompted many researchers to develop categories, or domains, of the teacher behaviors and beliefs that were considered desirable, as Combs (1972) did in his research.

Assessing Teaching Dispositions

Although research has indicated that possessing certain dispositional behaviors is indicative to a teacher becoming successful and effective, Helm (2006) stated that the term "disposition" was seldom utilized for teacher education until the late 1980s. Most, if not all, teachers possess at least some of the most fundamental dispositions necessary to teach young people and to engage them academically, and it seemed obvious that, as in all professions, some members would impact their field more than others (Albee & Piveral, 2003; Arnstine, 1990; Butler, 2001; Giovannelli, 2003; Helm, 2006; Levin & He, 2008; Wayda & Lund, 2005). Wenzlaff (1997) pointed out that it is imperative to realize that there are at least two components to a teacher's curriculum: the formal process which

includes materials, lesson plans, and objectives; and the informal which includes classroom environment, interactions, and attitudes about learning. In excellent teachers, the basic *desirable* dispositions, common to most teachers, will evolve into a belief system that causes the teacher to strongly believe that he or she is not just a cog in the educational process but someone whose teaching uniquely impacts their students' welfare (Wenzlaff, 1998). Through the lens of SCT, a teacher's instructional efficacy would be based on his or her own perceived success as a direct result of his or her teaching abilities.

At the university level, the experiences of a candidate enrolled in a teacher education program progressively increase as the level of involvement of the candidate evolves from observer to fully-participating team member, and several researchers noted that teacher education programs benefit from knowing candidates' preexisting beliefs and values and how these will interact with the training and knowledge gained from the teacher education program, the student teaching experience, or both (Albee & Piveral, 2003; Arnstine, 1990; Butler, 2001; Giovannelli, 2003; Helm, 2006; Levin & He, 2008; Wayda & Lund, 2005).

In 2000, the NCATE standards held teacher education programs accountable to assess professional dispositions in teacher candidates that are indicative of effective teaching, which resulted in many teacher education programs focusing on the area of how to measure dispositions. As mentioned previously, Combs (1972) examined and then created a method of measuring dispositions within the constructs of educational professions. Although his research provided strong empirical evidence that measuring dispositions could be accomplished, the actual instrument was difficult to learn and

required expert raters to interpret it. Professors at Eastern Kentucky University have completed extensive research in the field of teacher dispositions, have developed instruments to help schools of education examine dispositions of candidates, and have organized an annual conference specifically designed to provide a venue where education scholars are able to not only share their research findings, but also are able to learn from the research of others (McKnight & Douglas, 2004; Thornton, 2006; Wakefield, 1993; Wayda & Lund, 2005).

Levin and He (2008) conducted a study of 94 perspective teachers using an instrument that they developed to measure the sources of teacher candidates' belief systems and how these are impacted by university coursework. The perspective teachers were asked to self-report on how their dispositions are affected by personal beliefs about teaching and practical knowledge derived from teaching experiences. The researchers posited that the origination of candidates' dispositions fall into five categories: situation, personal, social, experiential, and theoretical. The findings from this study showed that preservice teachers' university coursework was the most likely to influenced their beliefs about teaching instruction. Although teacher education programs are designed so that candidates will be exposed to educational beliefs and values that may or may not align with their own, research has indicated that, even after completing intense programs in best practices, it is difficult to change preexisting beliefs and that most preservice teachers frequently hold on to many of their initial beliefs and values (Levin & He, 2008; Su, 1992; Wayda & Lund, 2005).

Dispositions of Teacher by Gender

Gender is relevant regarding the dispositional aspects of teaching, although much of the research on gender differences comes from a psychological perspective (Gilligan, 1982; Kimball, 1994; Miller, 1976). There are two different approaches to gender theory: the first is to focus on how men and women's dispositional practices are alike, and the second is to research how they differ. A higher percentage of secondary teachers are female, yet females are vastly underrepresented in leadership positions at the secondary level. To focus on how men and women are alike could disrupt the traditional explanations of why more males hold leadership roles because showing that these assumed knowledge sets and/or practical skills are not significant, or nonexistent, provides a strong argument that gender differences should not exist in educational leadership. Ironically, focusing on dispositional gender differences can also provide supportive evidence that females are not only well-suited for teaching effectively, but also to serve in capacities of leadership at the secondary level.

Much of the research on differences in the belief systems based on gender has been done by exploring the differences from the aspect perspective of how men and women respond to a scenario of moral dilemma, empirically, males and female equally tend to justify their reasoning based on justice or care, respectively (Gilligan, 1982; Kohlberg, 1981). Based on a core sample of 72 boys, Kohlberg (1981) theorized that, when faced with reasoning through a moral dilemma, males would frequently indicate stronger tendencies toward justice and a clear distinction between right and wrong. Gilligan (1982) observed that Kohlberg's moral stages were based on research that was done primarily on males. She conducted similar studies to Kohlberg on males and

females, and her research indicated that there are gender differences in the mental processes associated with moral development. In Gilligan's theory of moral development, girls are more likely to consider other humans through a lens of care, personal relationships, and the tendency to avoid causing others to hurt. These different moralities provide two distinct choices: the choice to not treat others unfairly (justice) and the choice to not turn away from someone in need (care). Gilligan (1982) contended that these moralities are distinct, yet she understood the potential for the two to be connected. Noddings (2002) expanded on Gilligan's psychological research in terms of the philosophy of education. Noddings posited that women are also more likely to become invested in relationships with their students, their peers, and others who are central to the classroom experience (2003).

Dispositions of Teachers Based on Years of Experience

No research outlined the dispositional differences between a novice teacher and an expert teacher, specifically, although discourse in research on teacher candidate seemed to indicate the need for more research beyond the induction year (Burn, Mutton, & Hagger, 2010; Levin & He, 2008). Burn *et al.* (2010) used qualitative data to study the second year of teaching of 17 teachers in different subject areas. One of their findings discussed how these teachers' dispositions toward teaching and learning impacted their effectiveness and efficacy. Levin and He (2008) posited that novice teachers have the arduous task of relinquishing the "idea of teaching" from their lens of having been a student for 18 or more years, and replacing it with the ability to master adaptive thinking and reflective practice regardless of what circumstances arise in the changing classroom. Their research predicted that preservice teachers will operate in the classroom based on

their dispositions; however, the researchers indicated that longitudinal research in this area is needed. Giovannelli's (2003) quantitative study provided empirical evidence that showed a relationship between a reflective dispositional stance in preservice teachers and the effective classroom teaching behaviors observed by their university supervisors, as well as discussed in her findings that more research is needed in the area. Research on dispositions indicated that teachers' practice is typically grounded in the intertwining of their individual experiences outside the classroom with their practical experiences inside the classroom (Brookhart & Freeman, 1992; Levin & He, 2008; Su, 1992; Wayda & Lund, 2005). The number of years that a teacher has taught would affect the impact of the practical classroom experience on his or her dispositions.

Dispositions in Secondary Mathematics Teachers

There is a perceived stereotype of a hierarchy that exists in American school systems between the elementary and secondary levels of schools, with secondary being considered at a higher level (Coke, 2005; Turner, 2003). In fact, at most universities, there is typically a distinction in their colleges of education between elementary and secondary programs of study, and research to show that there are distinct differences between those candidates who choose elementary education versus those who choose the secondary option. A study by Book and Freeman (1986) compared entry-level elementary and secondary education majors and found important differences in areas such as: academic background, career plans, prior experiences in teaching and in their expectations professionally. This study included 174 elementary and 178 secondary education majors enrolled in seven different content areas. One of the findings was that elementary students' reasons for entering the teaching field were more child-centered,

and secondary candidates' reasons were more apt to be due to their efficacy in the subject area and strong desire to teach that content. The study's findings also indicated that those students' who aspire to be teachers often have similar belief systems and/or reasons for doing so in general. This study provided empirical data to support that students who enter the secondary mathematics and science teacher tract are more likely to have taken advanced courses in mathematics and science, to have more perceived confidence in their ability to be effective in teaching in that content knowledge, are more likely to indicate their desire to transfer their love of subject to their students, and are more likely to see teaching as a stepping stone for another career path, such as education leadership (Book & Freeman, 1986).

Researchers have demonstrated that teachers with instructional efficacy were more likely to consistently demonstrate attributes that are aligned with effective teaching (Darling-Hammond & Sykes, 2003; Tschannen-Moran et al., 1998). Research by Darling-Hammond, Chung, & Frelow (2002) examined teachers' perceptions of their effectiveness and their sense of instructional efficacy based on their preparation to teach. The findings indicated that teachers who felt better prepared were significantly more likely feel high efficacy regarding their teaching effectiveness. Research in instructional efficacy grew out of the work of Bandura (1977) and his theories regarding self-efficacy. An individual's self-efficacy will influence the amount of effort, persistence, and resilience they will put forth in the face of obstacles (Bandura, 1977; Schunk, 2011). Likewise, a teacher's instructional efficacy will influence his or her teaching practices (Tschannen-Moran et al, 1998). There are a number of factors which will affect teacher efficacy including, but not limited to: (a) contexts of the classroom; (b) contexts of the

school; (c) contexts of colleagues, and (d) contexts of school leadership (Tschannen-Moran et al, 1998).

With the increasing awareness of standards-based teaching, researchers in mathematics education are paying closer attention to the *interpersonal* dispositions exhibited by teachers in the classroom environment (James-Wilson, 2001; Wagner & Herbel-Eisenmann, 2008). Being constantly aware of assessing student mastery of standards, teachers' instruction and curriculum are challenged and they often are faced with assessing their own mathematical knowledge and instructional skills to determine whether or not there is an impact to student learning. Many researchers indicated that knowledge or skills in mathematics does not guarantee effective teaching (Katz, & Raths, 1985). Day, Kington, Stobart, and Sammons (2006) posited that the emotional climate of the learning environment and the school will affect teachers' attitudes and beliefs about teaching.

Interactions that occur in the classroom, between teachers and students, as well as between students and students, are vital to substantial learning (Cohen & Ball, 1999). Leatham (2007) conducted a qualitative study in which he focused on preservice teachers' who were being trained in secondary mathematics. Although his research investigated the preservice teachers' beliefs about teaching mathematics using technology, his data provided evidence that core beliefs influence why mathematics teachers make certain instructional decisions. Stodolsky and Grossman (2000) reported that secondary mathematics teachers often consider their subject matter before their students' personal growth and reported that high school mathematics teachers' beliefs about teaching are affected by a variety of factors, including their belief systems. As

outlined earlier, research in the area of teacher dispositions indicated that a teacher's belief system is one of the factors that will affect his or her dispositions (Connelly et al., 1997; Collinson, 1996). Philipp (2007) described how mathematics teachers' belief about mathematics affects their perceptions of how to teach mathematics. In a study in 2003, Collopy concluded that a mathematics teacher's beliefs about mathematics, student learning, and his or her role in teaching can vary greatly from teacher to teacher. Her case-study research showed that two teachers in the same elementary school, teaching the same content from the same textbook had very different teacher dispositions based on how they perceive mathematics and their role in teaching the content. The study also provided evidence that teachers' resources, both intellectual and concrete, and dispositions greatly impacted students' engagement in learning.

Conceptual Metaphor

Metaphor is a term for a phenomenon that occurs naturally in all languages throughout the world. The study of metaphor as a concept began in the field of cognitive psychology and gained popularity with the publication of Lakoff and Johnson's book, *Metaphors We Live By* (1980). This book marked the beginning of metaphor study from a cognitive standpoint with an emphasis on how conceptual metaphors impact one's belief system and one's understanding of life experiences. This signified a shift in the research in that metaphor would no longer be viewed as only a linguistic device, but as a way to explain how one formulates basic ideas and concepts of many aspects of life (Fernandez, 2008; Katz & Law, 2010; Lakoff, 1998; Lakoff & Johnson, 1999; Leavy et al., 2007). Throughout a review of the literature, it became apparent that the study of conceptual metaphor can be applied to many different fields of study; however, the focus of this

study is on how metaphors of teaching informs the teaching, learning, and curriculum implementation of inservice teachers, and how metaphors of teaching reflect the dispositions of secondary mathematics teachers.

Historical Context of Conceptual Metaphor

Research into the historical context of metaphors comes from three distinct perspectives: rhetoric, linguistic and cognitive psychology. Rhetoric and linguistic fields' interest in metaphor as a construct of language dates back to ancient Greece (Lakoff, 1993); however, the research from a cognitive psychologists' perspective of focusing on metaphors and the relationship to belief systems has its beginning in the 1970s. Vgotsky (1978) viewed language as a system of symbols which mediate both thought and action and for several decades other researchers and teacher educators have argued that metaphors can reveal how reality and epistemological beliefs are constructed (Bullough, 2010; Hong-mei, 2010; Lakoff & Johnson, 1980; Patchen & Crawford, 2011; Sexton, 2004).

Research into metaphor as it shapes thinking, rather than as a figure of speech, accelerated in 1980 with the publication of Lakoff and Johnson's *Metaphors We Live By*. Since that time, Hong Mei (2010) observed that "scholars began to realize that the study of metaphor can be connected with a lot of other subjects, that is, metaphor can be applied in a lot of other fields, such as…teaching, and so on" (p. 176). Lakoff and Johnson (1980), Vgotsky (1978), and Bourdieu (1977) paved the way in cognitive psychology to unequivocally identify that metaphors, either consciously or subconsciously, have the potential to shape perceptions and to affect the relationship between how we think about our world and how we act based on that cognition. In the

past two decades, CMT has served as an overarching framework for researchers who seek to explore how metaphors of teaching are shaped by the beliefs of teachers and how the teaching metaphor might affect the relationship between what teachers think about teaching and how they act based on their thinking (Bullough, 2010; Hong-mei, 2010; Humphreys & Hyland, 2002; Leavy et al., 2007; Martinez et al., 2001; Patchen & Crawford, 2011; Sexton, 2004).

Metaphors of Teaching and Professional Dispositions

Because research supports the premise that teachers have their own views and belief systems which impact their thinking and behaviors of teaching, it is important to understand the influence that a teaching metaphor plays on their practice (Patchen & Crawford, 2011; Yung, 2001). Martinez et al. (2001) studied more than 50 experienced and 38 preservice teachers. Martinez et al. found that the majority (57%) of the teaching metaphors held by experienced teachers depicted teaching as a transmission of knowledge (a behaviorist/empiricist perspective), with a smaller group (38%) who expressed teaching metaphors that were categorized as constructivist. Only a small minority of teachers (5%) expressed teaching metaphors that could be categorized as based on social processes. The researchers also found that experienced teachers' metaphors for teaching reflected their practices and classroom climate. For example, a teacher who perceives himself or herself as the captain would tend to have strict practices regarding his or her classroom management. In comparison, the majority of the 38 preservice teachers' metaphors for teaching were categorized as constructivist (56%); a smaller number described metaphors as teaching that would fall in the behaviorist domain (22%); and a slightly smaller number described teaching metaphors that were social in

nature (23%). Martinez et al. (2001) summarized that the difference in the type of teaching metaphors held by experienced teachers versus preservice teachers can be contributed to the experience in the classroom.

As reviewed earlier in this section, preservice teachers' beliefs about teaching and learning is derived from three main sources, in a hierarchical order: (1) personal experiences as students themselves; (2) experiences with schooling and instruction as preservice students; and (3) the formulation of their pedagogical knowledge through formal instruction. Leavy et al. (2007) studied 124 preservice teachers over an academic year of university coursework. The intent of this study was to explore how preservice teachers develop their teaching metaphors and to use this development as a way to examine, and possibly modify, the beliefs that preservice teachers bring into their university programs. This research replicated the Martinez et al. (2001) study except that the focus was only on preservice teachers and these researchers explored how the teaching metaphors changed over the course of an academic year in university coursework, which included the teaching practicum. Leavy et al. (2007) found that the teaching metaphors of some of the preservice teachers changed over the course of the teacher training. These researchers discussed how teaching metaphors are an important key in helping the preservice teachers to understand themselves as teachers and in their how they build their teaching practice and skills. Furthermore, the researchers suggested that preservice teachers preexisting beliefs about teaching shaped their initial metaphor of teaching. In addition, the researchers wanted to explore how experiencing professional growth through the university, as well as field experiences, would affect and/or change their teaching metaphors.

Teaching metaphors extend into how teachers view teaching resources as well. McGrath (2006) outlined multiple metaphors that teachers and students use to conceptualize a textbook, such as a lighthouse, a map, a rock, and he found that these conceptualizations influenced how the textbook was used. He concluded that there is value in studying how teachers' attitudes about textbooks influenced the metaphor chosen for the textbook. Likewise, there is value in exploring how teaching metaphors affect teachers' decision-making, interactions, and experiences in their teaching practice.

Metaphor of Teaching and Mathematics Teachers

Humans are born with an innate sense of arithmetic (Lakoff & Nunez, 2000; Nunez, 2008). At a very young age, babies are able to sort and group objects and they are able to recognize properties of ordering, as can many animals such as parrots, pigeons, raccoons, rats, and chimpanzees (Lakoff & Nunez, 2000). Lakoff and Nunez (2005) wrote that conceptual metaphors are a key component in the study of mathematics. The researchers discuss at length mathematical ideas, such as infinity and sets, which are both theorized and explained through metaphorical concepts. Likewise, Noyes (2006) suggested that the list of metaphorical statements in the realm of mathematics is very extensive, but typically fall into three general types: grounding metaphors, linking metaphors, and extraneous metaphors. Grounding metaphors are directly related to grounded ideas such as addition meaning "adding to a collection," set as "a container to hold elements," the quadrilateral that is shaped as a "kite" is also named kite, etc. Linking metaphors require more sophisticated metaphorical ideas such as numbers can be represented as "points on a line," geometrical figures can actually "yield algebraic equations," an increase in slope indicates "rising," and a negative slope indicates

"falling." Although grounding and linking metaphors are essential for the conceptualization of the content of mathematics, Lakoff and Nunez (2000) concluded that: "…extraneous metaphors have nothing whatever to do with either the grounding of mathematics or the structure of mathematics" (p. 53). An example of an extraneous metaphor is the "step function," which, when graphed, can look similar to a staircase. The image of a staircase has nothing whatever to do with either the inherent content or the grounding of the mathematics, although the visual is a helpful reminder of how this function would look when graphed. Extraneous metaphors can be eliminated without any substantive change in the conceptual structure of mathematics, whereas eliminating grounding or linking metaphors would make much of the conceptual content disappear.

Grounding and/or linking metaphors are used by mathematics teachers in order to make sense of mathematical concepts for their students. In the same way, teaching metaphors help mathematics teachers make sense of teaching and learning processes (Bullough, 2010). Chapman (1997) also pointed out that teacher belief systems have a powerful effect on how teachers form their teaching metaphors. Teachers' belief systems are based on the classroom experiences of the teacher, both as a teacher and a learner. Chapman's qualitative study focused on mathematics teachers' perspective on teaching problem solving. Her findings indicated that the teachers' personal metaphors for teaching problem solving seemed to form unconsciously, and became the basis of how they made sense of their teaching.

In a study of preservice teachers, Noyes (2006) discovered that if teacher education programs are charged with challenging, and sometimes changing, mathematics teachers' dispositions, then CMT needs to be considered for its potential value in

changing preservice mathematics teachers' discourse and practices. Noyes argued that a clearer understanding of a teacher's teaching metaphor will result from studying the teacher's metaphorical language used during teaching, and the belief system that the teachers brings into the classroom.

Noyes's case-study involving preservice mathematics teachers used over 50 assignments as data with regards to the preservice teachers' beliefs about mathematics, their metaphoric language used when talking about mathematics, and their metaphors for teaching, which were reported at the beginning of the study. In his findings, Noyes reported that he found four root metaphors through his analysis of the data. He related these root metaphors to the three main types of metaphor image schemas described in Lakoff (1998) were: containers, paths, and force-images (p. 228). Noyes's (2006) work was focused on identifying the belief systems on which his students' metaphoric language and teaching metaphors were based. His reason for studying the beliefs systems was to develop a process by which the metaphors of preservice teachers can be questioned and challenged. Noyes posited that understanding metaphoric framework provides the initial work into developing processes for pedagogic professional development that would provoke critical self-reflection and discussion regarding the work of teaching mathematics for preservice teachers.

Conclusion

A teacher's dispositions are strongly linked to their belief system (Arnstine, 1990; Elbaz, 1981; Furinghetti, 2007; Katz & Raths, 1985; Ryan & Deci, 2000). Likewise, research supports the assessing the dispositions of preservice teachers; however, research assessing the dispositions of inservice teachers is limited. A strong tradition exists in

educational research to examine the belief systems of mathematics teachers with regard to how these beliefs are related to teaching practices (Lakoff & Nunez, 2000; Noyes, 2006; Nunez, 2008). Furthermore, a strong research base exists regarding examining the metaphors of teaching of preservice teachers (Bullough, 2010; Leavy et al, 2007; Mahlios et al., 2010; Richlin, 2006; Saban et al., 2007), and how metaphors of teaching are influenced by teachers' belief systems (Alger, 2008; Bullough, 2010; Hong-mei, 2006; Humphreys & Hyland, 2002; Ingersoll, 2003; Martinez et al., 2001; Sexton, 2004; Yung, 2001); as well as research specific to mathematics teachers (Chapman, 1997; Lakoff & Nunez, 2000; Noyes, 2006; Nunez, 2008).

Literature supports that dispositions are linked to belief systems (Arnstine, 1990; Elbaz, 1981; Furinghetti, 2007; Katz & Raths, 1985; Ryan & Deci, 2000) and that teacher's teaching metaphors are also linked to their belief systems (Alger, 2008; Bullough, 2010; Hong-mei, 2006; Humphreys & Hyland, 2002; Ingersoll, 2003; Martinez et al., 2001; Sexton, 2004; Yung, 2001); The findings from this research study will further inform research in education with regards to inservice, mathematics teachers' metaphors of teaching and the hypothesized link between their teaching metaphors and their dispositions.

Statement of Hypotheses

This study investigates the dispositions of inservice teachers at the high school level. It examines the effects of demographic characteristics on teacher dispositions, and through qualitative measures explores mathematics teachers' perceptions of dispositions and metaphor of teaching. Specifically, the current study seeks to find answers to the

following questions, and after careful review of the theoretical framework and the literature review, the following hypotheses are proposed:

Question 1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus professional, curriculum-centered stances?

Question 1 establishes the teacher dispositions of teachers at the secondary level.

Question 2: Are there significant differences in the dispositions of inservice teachers based on gender? If so, what are the differences?

Question 2 considers the effect of gender on a secondary teacher's dispositions.

Hypothesis 2: Based on the work of Gilligan (1992) and Noddings (2003), females tend to have a greater sense of empathy and focus on relationships. The hypothesis is that there is a significant difference in the dispositions of secondary teachers based on gender, with females scoring higher on the student-centered dispositional subscale.

Question 3: Are there significant differences between the dispositions of teachers based on years of experience? If so, what are the differences?

Question 3 considers the effect of years of teaching experience on a secondary teacher's dispositions.

Hypothesis 3: Novice teachers come into teaching with limited knowledge of planning instruction and classroom management. Their pedagogy is based on knowledge gained from teacher education, and will continue to develop as they encounter other teachers and experiential knowledge. There is a significant difference in the dispositions

of secondary teachers based on years of experience, with teachers having less years experience scoring higher on the student-centered dispositional subscale.

Question 4: Are there significant differences between the dispositions of teachers based on their age? If so, what are the differences?

Question 4 considers the effect of the age of the secondary teacher's dispositions.

Hypothesis 4: There is a significant difference in the dispositions of secondary teachers based on their age, with younger teachers scoring higher on the student-centered dispositional subscale.

Question 5: Are there significant differences between the differences of mathematics teachers and other content areas? If so, what are the differences?

Question 5 considers if there are differences in the dispositions of mathematics teachers when compared to secondary teachers in other content areas.

Hypothesis 5: There is a significant difference in the dispositions of secondary teacher mathematics teachers when compared to other content area teachers. Stodolsky and Grossman (2000) stated that secondary mathematics teachers tend to focus on their subject matter before their students. The hypothesis is that mathematics teachers will score higher on the curriculum and professionalism dispositional subscale.

Question 6: What are mathematics teachers' metaphor of teaching, and what is the relationship between their metaphors and dispositions?

Question 6.1: What are the differences in mathematics teachers' metaphor of teaching and dispositions when considering differing demographics of gender, age, years of experience, and/or highest earned degree?

Question 6.2: What is the relationship between mathematics teachers' expressed metaphors and their instructional practices or models?

Questions 6, 6.1, and 6.2 examine mathematics teachers' perceptions regarding dispositions and metaphor of teaching. Question 6.1 examines if demographics affects a mathematics teachers' perceptions regarding their dispositions and/or metaphor of teaching. Question 6.2 seeks to explore if secondary mathematics teachers perceive that dispositions and/or metaphor of teaching influences their discourse, planning, and teaching of mathematics.

Summary

This chapter provided a theoretical framework for this inquiry and included a review of literature regarding the various aspects of professional dispositions as outlined in research questions 1 thru 5. Metaphor of teaching, specifically in secondary mathematics teachers informs the qualitative research as outlined in questions 6, 6.1, and 6.2. This chapter also included a restatement of the research questions as hypotheses that will be answered in the quantitative phase of this two phased research.

CHAPTER 3

METHODOLOGY

The primary goal of this chapter is to present the methods and procedures for determining if differences in dispositions were detected in the understudied population of inservice teachers. More specifically, do secondary mathematics teachers perceive that their dispositions and/or their conceptual metaphors impact their decision making with regards to curriculum and instructional practices? The organization of the chapter includes the following topics: (1) restatement of the research questions; (2) the research paradigm including the philosophical assumptions that guided the study and the positionality of the researcher; (3) the research design; (4) the research setting; (5) the participants; and (6) the instrumentation used to collect data. The chapter concludes with a detailed description of the analysis of the data and measures of reliability and validity.

Research Questions

The purpose of this study was to determine if there were mean differences in the teacher dispositions of secondary inservice teachers, specifically in five demographic domains: gender, age, content area, highest earned degree, and years of experience. This study also investigated if there is a relationship between mathematics teachers' dispositions and their conceptual metaphors of teaching.

The following research questions guided this research study.

Question 1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus teacher-centered stances?

Question 2: Are there significant differences in the dispositions of inservice teachers based on gender? If so, what are the differences?

Question 3: Are there significant differences between the dispositions of teachers based on years of experience? If so, what are the differences?

Question 4: Are there significant differences between the dispositions of teachers based on their age? If so, what are the differences?

Question 5: Are there significant differences between the differences of mathematics teachers and other content areas? If so, what are the differences?

Question 6: What are mathematics teachers' metaphors of teaching, and what is the connection between their metaphors and dispositions?

Question 6.1: What are the differences in mathematics teachers' metaphors and dispositions when considering differing demographics of gender, age, years of experience, and/or highest earned degree?

Question 6.2: What is the relationship between mathematics teachers' expressed metaphors and their instructional practices or models?

A critical review of scholarly, professional, and peer reviewed literature was conducted before designing the study, using the EBSCO data base, Academic Search Complete, SAGE, JStor, Dissertation Abstracts International, Kennesaw State University Library, and Digital Commons at Kennesaw State University. This critical review indicated that teacher dispositions can be assessed and are indicative of effective teaching; however, the majority of the literature is primarily focused on assessing preservice teachers' dispositions rather than those of inservice teachers (Burant, Chubback, & Whipp, 2007; Butler, 2001; Collinson, 1996; Eberly, Rand, & O'Connor,

2007; Gay & Kipchoge, 2003; Giovannelli, 2003; Helm, 2006; Levin & Ye, 2008; Katz & Rath, 1985; McKnight & Douglas, 2004; Thornton, 2006; Wayda & Lund, 2005; Weiner & Cohen, 2003; Wenzlaff, 1998; Whitsett, Roberson, Julian, & Beckham, 2007). This researcher sought to add to the literature base regarding the teacher dispositions of inservice teachers. A review of the literature revealed that teacher dispositions and conceptual metaphors of teaching have a common thread when they are consistently linked to belief systems (Geary, 2011; Lakoff, 1998; Katz & Raths, 1985; Ryan & Deci, 2000; Weiner & Cohen, 2003).

Therefore, the purpose of this study was to assess the dispositions of inservice teachers in one high school to determine if there were significant differences in the dispositional stance of inservice teachers, specifically in five demographic domains: gender, age, content area, highest earned degree, and years of experience. This study also further investigates four mathematics teachers' in the same high school and their perceptions of teacher dispositions and conceptual metaphors of teaching.

Research Paradigm

The present examination used a two-phased research design to address the research questions in a sequential way to generate data regarding the professional teacher dispositions and conceptual metaphors that may inform teaching and teaching practices. During the first phase quantitative data were collected and during the second phase, a qualitative paradigm was utilized to help address the research questions. Wiersma and Jurs (2009) stated that research that is conducted in school settings is often better informed using both qualitative and quantitative methods. By using both quantitative and qualitative data, the researcher can build information from each one to provide stronger

evidence for the study (Johnson & Onwuegbuzie, 2004). Bryman (2007) further concluded that combining quantitative and qualitative findings generates opportunities for insights into the research study that might not otherwise become evident when using only one lens.

In research, a paradigm is a basic way of viewing the world and is comprised of philosophical assumptions that guide and direct a researcher's thoughts and actions throughout the research process (Bogdan & Biklen, 2007; Maxwell, 2005; Mertens, 2010; Wiersma & Jurs, 2009). When conducting a mixed-methods study, it is important to consider the researcher's philosophical assumptions that will guide the qualitative phase of the study (Creswell, 2007; Merriam, 2009). Maxwell (2005) asserted that when choosing the paradigm that guides the methodology, it is important for the researcher to examine which one best fits his or her philosophical assumptions. According to Merriam (2009), an ontological assumption focuses on what one believes about the nature of a phenomenon and an epistemological assumption of how one understands it.

After considering several paradigms, this researcher chose a stance of pragmatism as the best fit for the ontological and epistemological assumptions. Pragmatists value that participants have multiple perspectives based largely on the contexts of their setting. Pragmatists work from the perspective that individuals create their own subjective and intersubjective meanings as they interact with the world around them and this is a common approach in mixed method studies (Mertens, 2010; Merriam, 2002). Creswell (2007) stated that pragmatists do not focus on the methods so much as they do on understanding phenomena and the meaning assigned to them. An approach of pragmatism is best when the researcher's intent is to understand the deeper structure of a

phenomenon, to use the phenomenon to inform other settings, and to heighten the understanding of the phenomenon within cultural and contextual situations (Creswell, 2007; Merriam, 2002). By maintaining a pragmatic stance, this researcher placed importance on observing the mathematics teachers in their natural setting (e.g. their classrooms) and on what they revealed during the interviews. This researcher's focus was on the data gathered, the themes that emerged, and how these answered the research questions. A pragmatic outcome of this research study may be the potential for planful, targeted, and ongoing professional development for inservice teachers regarding teacher dispositions and conceptual metaphors of teaching.

Research Design

A two-phased study requires that the researcher combine all data gathered from quantitative and qualitative methods to provide evidence in support of the examination's conclusions (Maxwell, 2005; Merriam, 2009). This study utilized a sequential mixed design. In phase one, a non-experimental quantitative design was employed utilizing survey research, which involved administering a valid and reliable instrument designed to assess teacher dispositions (Schulte et al., 2005). According to Punch (2005), non-experimental design will show naturally occurring variations between the independent variables in a research study. Creswell (2009) reported that survey research provides a numeric analysis that determines if relationships exist between the defined independent variables and the dependent variable. The instrument utilized in the current examination was the Teacher Dispositions Index (TDI) developed by Schulte et al. (2005). The TDI was developed as a means to measure the dispositions of preservice teachers and to align

with the dispositions of effective teachers as specified under INTASC's (1992) Model Standards for Beginning Teacher Licensing and Development.

This research study is designed to assess the dispositions of inservice teachers; however, the review of the literature and of research on dispositions did not reveal an instrument that was developed to assess inservice teachers. The decision was made to use the TDI because it had strong reliability and validity when assessing preservice teachers. This will be discussed in more detail in the research instrumentation section. Permission to use the TDI was granted by Dr. Laura Schulte. All participants completed an identical survey by accessing a hyperlink which was emailed to them simultaneously through Google Documents. Participants were asked to complete the survey online within 21 days of receipt of the email. The survey results were then analyzed using statistical tools that delivered descriptive reports on teacher dispositions, as well as any mean differences between groups.

After the survey results were collected, tabulated, and analyzed, the qualitative portion of the research was conducted. The methodology chosen for the qualitative phase was an observational case-study. A case-study can be conducted with one or more participants, utilizes multiple sources of information, and is used to report case descriptions and case-based themes (Creswell, 2007; Merriam, 2002; Mertens, 2010). Observational case-study was selected in order to obtain the "how" and "why" of the mathematics teachers' perceptions by using classroom observations and interviews in order to gather richer data (Wiersma & Jurs, 2009; Yin, 2009). The researcher believed that observations of the participants in their natural setting would provide rich data to address the qualitative research questions.

Phase two of the study was conducted using three types of data collection approaches: individual interviews, classroom observations, and a focus group discussion. Bogdan and Biklen (2007) explain that having multiple sources of data for each participant will allow the researcher to strengthen the internal validity of the study through triangulation. During the qualitative phase of this research, individual and focus group interviews, classroom observations, researcher's memos, and the researcher's written memos during data collection were used to triangulate the findings.

This study could be described as heuristic. Merriam (2009) stated that when case studies enlighten what the researcher understands of the phenomenon being studied, those studies are called heuristic. A heuristic case-study explores the possibilities of the outcomes, extends the reader's experiences, or confirms what is already known about the phenomenon.

Setting

In qualitative research the naturalistic setting is typically the primary source of the data collection (Bogdan & Biklen, 1992). Because the purpose of this two-phased study is to examine the relationship between the teaching dispositions of secondary mathematics teachers and the conceptual metaphors of mathematics teachers, the most natural setting in which to collect data is a high school. Creswell (2007) reported that analysis of the setting and the case should be described in detail. The cases in this study were four mathematics teachers, who will be described in greater detail later in this chapter. The cases are bounded by the fact that they are all mathematics teachers in the same high school. The cases were analyzed individually using open, axial, and selective coding of the data collected in the open-ended survey questions, the individual interviews

and the classroom observations. The cases were analyzed as individuals and a cross-case analysis was conducted by the researcher using open, axial, and selective coding of the data collected from the focus group discussion. The researcher was specifically examining the mathematics teachers' perceptions of their conceptual metaphors and to investigate links between their metaphors and their dispositional stance based on the subscales of the TDI. This case-study was conducted at Blue Ribbon High School (BRHS), a pseudonym, which is located in an affluent suburb of a large metropolitan city in the southeastern U.S. At the time of the study, BRHS had 2,627 students and 278 staff members, of whom 144 are classified as certified teachers. The ethnicity breakdown of the students at the school follows: Asian-5%, Black-7%, Hispanic-5%, Multi-Racial-2%, Other-2%, and White-79%. Approximately 6% of the students are economically disadvantaged and received free or reduced lunch. Special education students represent 7.27% of the population, gifted at 34% of the population, and 1% of the population are classified as remedial. This high school is ranked as one of the top schools at the state and national levels.

Population Sample

Sampling

Bogdan and Biklen (1992) reported that random sampling may not always be appropriate or possible in education settings. In this study, the teachers who participated in the quantitative phase were a sample of convenience given that this district only allows quantitative research to be conducted at one's home school. Given the parameters set by the researcher's district office, random sampling was not an option for this study; therefore, the sample of teachers who were asked to participate in the qualitative phase

was purposeful in an attempt to maximize the variation of the participants. A purposeful sampling approach was used to generate information-rich cases that further illuminated the findings and uncovered variation, as well as determined if there were any significant common patterns (Merriam, 2009). In choosing the four mathematics teachers, it was assumed that each one would provide rich descriptions during the investigation phase of the qualitative research (Creswell, 2007; Maxwell, 1992; Mertens, 2010). All of the participants in this research study were high school teachers. There were 144 teachers in the building at the time of this study. All teachers in the building received the survey instrument electronically via electronic mail. Fifty-two teachers returned the surveys, with 13 of those classifying themselves as mathematics teachers. Four of the 13 mathematics teachers were purposefully chosen to participate in the qualitative case-study. The researcher purposefully chose participants who provided a maximum variation of demographics, in order to investigate mathematics teachers whose range of age, type of degree, and years of teaching experience were as diverse as possible. As an active participant in data collection, the researcher was intent on understanding how secondary mathematics teachers verbalized their conceptual metaphor as it related to their teaching.

As per district regulations on research, IRB approval was obtained from the university through which this research was supported, and permission to conduct the study was granted by the principal of the high school. All participants were asked to check a box at the beginning of the survey which indicated their consent to participate. Teachers were encouraged to respond thoughtfully and truthfully to the dispositions survey and open-ended question survey.

Participant Descriptions

In phase one of this study, 52 out of 144 teachers completed the online survey. The participants self-identified demographic information such as gender, age, years of teaching experience, educational attainment, and content area. The demographic information is found in table 3.1. Two-thirds of the survey participants were female and 73% of the participants attained a masters degree or higher.

Table 3.1. Summary of phase one participants' demographic information

	Gender		Content				Educational Attainment					
	Male	Female	Math	Lang Arts	Social Studies	World Language	Science	Other	Bachelors	Masters	Specialist	Doctorate
n	17	35	13	12	5	2	7	13	14	28	7	3
%	33	67	25	23	10	4	13	25	27	54	13	6

Participants in phase two of the study were purposefully selected from the 52 teachers who answered the three open-ended questions at the end of the online survey. Of the 52 teachers, 13 identified themselves as mathematics teachers, and four of the 13 mathematics teachers were asked to participate in the qualitative phase of this study. The researcher sent an email to the mathematics department of BRHS to poll the interest level each of them had to participate in the interviews. A copy of the email is in Appendix D. The email allowed the teachers to select "yes" or "no" to indicate who would be willing to be a participant. Of the 21 mathematics teachers, nine indicated "yes" on the poll. Of the nine teachers who indicated "yes," four were asked to participate based on the demographics of each one. The researcher purposefully selected teachers that best represented a range of demographic categories, and each participant's demographic

information is described in Table 3.2. Once the participants were selected, the researcher made arrangements with each one to conduct an individual interview, a classroom observation, and a focus group discussion. Participants will be discussed at length in chapter four.

Table 3.2. Summary of phase two participants' demographic information

Teacher Pseudonyms	Gender	Age	Yrs of Exp	Degree Earned
Bill	Male	35	7	M.A.T.
Susan	Female	53	23	M.Ed.
Donna	Female	57	5	B.S. Ed.
Mary	Female	23	1	B.S. in Mathematics; Enrolled in M.A.T.

Prior to beginning the study, the researcher gained the permission of the high school principal according to district guidelines for conducting research. The researcher then filed the appropriate paperwork with the university's IRB and was given approval to conduct the study prior to contacting any teacher regarding participation. The participants in this research study did so voluntarily and all of them indicated their consent prior to participation. The researcher employed the following measures to ensure confidentiality: using pseudonyms, to maintain the confidentiality of the participants' names, demographic information, as well as any data collected from the participants. The results collected from the survey, and well as the case-study database were stored on the researcher's password protected external hard drive. In the qualitative phase, pseudonyms

were assigned to each of the participants and used throughout the write-up of the analyses. Neither identification of names nor information was asked for during the interviews. The researcher used several different strategies to bolster credibility and transferability, which included confirming and triangulating the data from several sources to ensure that the findings converged, and having the researcher's dissertation committee review the data collection procedures (Bogdan & Biklen, 2007; Creswell, 2007; Grbich, 2007; Merriam, 2009; Mertens, 2010; Weirsma & Jurs, 2009). Research memos were also recorded after data were collected, and member checking was used to verify that the data collected was accurate (Creswell, 2007).

Data Sources

Grbich (2007) reported that "mixing quantitative and qualitative data sets have the capacity to broaden and enrich research questions using styles of synthesis, triangulation, and iteration" (p. 203). In order to collect rich, descriptive data that could be triangulated for transferability and credibility, this research study utilized five data sources, which were collected in two phases. Each phase of this study was designed to explore, analyze, and interpret the collected data as a means to comprehensively answer each of the research questions and to provide information that would add to the body of literature, especially because the focus of prior research on dispositions has been conducted with preservice teachers rather than inservice teachers (Merriam, 2009). The first phase of data collection included a survey instrument which collected quantitative demographic data, measured two sub-scales, and included three open-ended items for qualitative analysis. During the second phase, the data sources included interview responses, video recordings, and the researcher's memos and field notes. In the following sections, all data

sources are described in greater detail and the researcher's discussion is ongoing throughout each section.

Surveys

Wiersma and Jurs (2009) indicated that there are two general types of survey instrumentation: selected-response and open-ended items. In phase one of the research study, a survey instrument, containing both selected-response and open-ended items, was used to address research questions one through five. The Teacher Dispositions Index (Schulte et al., 2005) is the selected-response questionnaire that was used as the instrument in the quantitative phase of this research. Dr. Schulte authorized the researcher to use this instrument for data collection. The framework for the Teacher Dispositions Index (TDI) was the 2002 INTASC principles (Appendix E) and their corresponding indicators. The procedures used to develop and validate the TDI included an item development phase as well as procedures to provide evidence of the TDI's content and construct validity, in addition to reliability tests. The procedures used in the development of the TDI replicated those used by Schulte et al. (2002) in the development and validation of the School Ethical Climate Index. Item development was based on other assessment instruments that evaluate teacher effectiveness and/or teacher belief systems. Schulte et al. (2005) reported that the following data analyses were conducted to investigate the construct validity and reliability of the TDI (Schulte et al., 2005):

1. The construct validity and dimensionality of the TDI was evaluated with exploratory factor analyses using a principal axis factoring method followed by a varimax rotation of the number of factors extracted. The principal axis factoring method was employed rather than the principal components method

because the developers wanted to investigate common variance in order to determine the number of dimensions that the TDI measured. A copy of the factor analysis table is available in Appendix E.

2. The reliability of the TDI subscales was estimated using coefficient alpha (Cronbach's alpha). The reliability estimate for the 25-item student-centered subscale was .98. The reliability estimate for the 20-item professionalism, curriculum-centered subscale was .97.
3. The respondents' perceptions of their dispositions was summarized as effective teachers by calculating mean scores for each of the TDI subscales (Appendix E).
4. To investigate the relationship between respondents' scores on the TDI subscales and their age, gender, and certification level, independent *t*-tests, and *ANOVA*s were conducted. All statistical analyses were conducted at .05 level of significance.

Grbich (2007) reported that using open-ended questions on a survey is another way to combine quantitative and qualitative methodology. The researcher decided to include three open-ended questions on the TDI that were intended to give the participants a chance to expand on the selected response, dispositional questions. The answers to these three open-ended questions were considered to be an additional data source for the qualitative phase of the research. Of the 52 participants who completed the survey in phase one of the research study, 51 of them answered all three of the open-ended items. The answers from the incomplete survey were not used in the coding of the data.

Interviews

The interview questions (Appendix A) were designed to capture the thoughts of the mathematics teachers through their answers regarding their perceptions of their individual dispositions and metaphor for teaching. The questions were specifically written to inform research questions 6, 6.1, and 6.2. The interview questions were intended to facilitate an open and organic conversation regarding the mathematics teachers' notions of teaching metaphors and dispositions (Merriam, 2009). The interview consisted of 12 questions that were written by the researcher and were based on research studies designed to explore teacher dispositions and metaphors of teaching (Eberly, Rand, & O'Connor,2007; Giovannelli, 2003; Helm, 2006; Homg-mei, 2010; Katz & Rath, 1985; Kern, 2006; Lakoff, 1998; Lakoff & Johnson, 1980, 1999; Lakoff & Nunez, 2000; Leavy et al., 2007; Mahlios et al., 2010; Martinez et al. , 2001; Noyes, 2006; Patchen & Crawford, 2011; Saban et al., 2007; Yob, 2003).

In a few selected studies on metaphor of teaching, researchers offered their participants several teaching metaphors from which to choose as a way to describe their teaching (Patchen & Crawford, 2011). It was the researcher's belief that offering a preexisting metaphor would not be the best way to proceed because that might lead the teachers to answer differently than by having to reflect on their unique and personal metaphors (Mahlios, Massengill-Shaw, & Barry, 2010; Martinez et al., 2001). Furthermore, this researcher decided that a more organic discussion would develop if the teachers were asked to ponder the metaphor questions before having open conversations with one another and without being predisposed by having to choose one provided metaphor over another. The interview questions were designed to allow the mathematics teachers to reflect on their answers to the survey instrument, as well as their own

perceptions of teaching metaphors (Bogdan & Biklen, 2007; Creswell, 2007; Grbich, 2007). The questions included in the interview guide focused on the conceptual metaphor research, teaching dispositions research, each participant's disposition subscale (as revealed by the TDI), and his or her perceptions regarding metaphors of teaching.

Classroom Observations

A focus in phase two of this research study was to analyze whether what teachers did and/or said in their classroom would align with what they communicated in the interviews regarding their perceptions of teacher dispositions and/or conceptual metaphors of teaching. An organizational tool is an appropriate aid in collecting observation notes (Merriam, 2009). The researcher created a matrix that would provide structure, without limiting the observations. The observation matrix had six columns in which to record observations. An example of the observation matrix that was designed by the researcher is shown in Figure 3.3. The first row documented the pseudonym of the teacher, the date of the observation, the dispositional stance as informed by the TDI, and the self-reported metaphor as informed by the individual interview. The first and second columns provided space for the researcher to document any comment or action that could be related to either dispositional subscale. The researcher used the TDI as a guide to recognize discourse and/or teaching actions that would be interpreted as student-centered or curriculum-centered. The third column allowed for the researcher-observer to add examples of discourse and/or actions that was categorized as evidence of the teacher's self-reported metaphor, or evidence of a different metaphorical reference.

Figure 3.3. Matrix to record and categorize noteworthy observations

Classroom Observation Matrix	Teacher Pseudonym:	Date:
Dispositional Stance:	Self-reported Metaphor:	
Examples of each stance and/or of metaphor references will be recorded below:		
Student-Centered Stance	Professional, Curriculum-Centered Stance	Metaphor

Data Collection Procedures

During this research study, multiple data sources were collected from the participants to achieve triangulation of findings. This is a crucial element to validate an observation case-study and for mixed-method designs in general (Creswell, 2007; Merriam, 2009; Yin, 2009). Prior to beginning data collection, IRB approval and participant consent were obtained (Appendix C). Afterward, the phases of the data collection proceeded as follows: (1) administration of the TDI electronically; (2) open-ended survey questions; (3) individual interviews; (4) classroom observations; (5) member checking; (6) field notes and memos; and 7) focus group discussion.

Phase One: Quantitative Data Collection

Punch (2005) proposed that in a mixed-methods study, a survey instrument is a common way to collect data in the quantitative phase. The TDI was provided to all of the teachers at BRHS utilizing the survey application of Google Documents via the school e-mail. This resulted in a convenience sampling from a pool of participants from the high school in which the study took place (Creswell, 2007). A copy of the electronic mail is

included in Appendix D. The researcher asked that the survey be completed within a period of 21 days. Because the survey was electronic, as the participants responded, their answers were automatically collected on a spreadsheet in Google Documents. At the end of the 21 days, the spreadsheet was downloaded from Google Documents directly into Statistical Analysis System (SAS) and the Statistical Package for Social Sciences (SPSS) for statistical analysis. The responses remained confidential and only the responses of the self-identified mathematics teachers were used to inform the qualitative portion of this study.

Phase Two: Qualitative Data Collection

Because the researcher needed to collect rich and meaningful data that would triangulate for strong reliability and validity (Creswell, 2007; Merriam, 2009), five sources of data were utilized. The data sources included: three open-ended questions which were added to the survey in phase one, the researcher's memos written during the data collection phase and the analysis phase, individual interviews, classroom observations, and a focus group discussion involving the four mathematics teachers.

The first data source was added to the TDI and were answered by 52 participants in phase one. The TDI was designed to measure two dispositional stances: student-centered and teacher-centered. Previous research on teacher dispositions also identified a dispositional stance that is teacher-centered (Whitsett, Roberson, & Beckham, 2007). The researcher added three open-ended questions to explore how the teachers who completed the survey would respond to questions regarding the teacher-centered dispositional stance.

Three of the data sources were generated by four of the thirteen mathematics teachers who completed the survey. As stated previously, these four teachers were purposefully selected to participate in the qualitative phase of the study based on their diverse demographics. Each teacher was interviewed utilizing a semi-structured, open-ended method using the interview questions developed by the researcher (Creswell, 2007; Merriam, 2009). The interview questions (Appendix A) were written by the researcher and aligned with research on teacher dispositions and conceptual metaphors for teaching that was presented in chapter two. The first question asked the four participants to expand on life experiences that prompted them to enter the teaching field. This information helped to inform the researcher's interest in exploring if a relationship exists between the teaching dispositions and the conceptual metaphor that each participant has for teaching. Questions 2-6 were designed to explore each participant's conceptual metaphor and to ask them to expound on how they perceive it impacts his or her planning and instructional choices. Questions 6 and 7 were designed to explore each participant's teaching disposition(s). The remaining five questions were designed to explore if each participant perceived a link or relationship between his or her teacher dispositions and his or her conceptual metaphor for teaching.

The researcher had an established rapport with each of the participants and three of the four interviews were conducted in a closed office where there were no distractions possible to disrupt the flow of the interviews. The fourth interview with "Mary" was conducted in her classroom during her planning time. The high school building is quite large and Mary's classroom is in the very back of the campus. Therefore, the researcher walked out to her classroom because she only has 55 minutes between classes and it

would have taken her at least 15 minutes to walk from her classroom to the office where the other three interviews had taken place. All four interviews were conducted in a semi-structured manner, which means that the questions and/or order of the questions were not predetermined to be presented in a highly structured and strict manner (Merriam, 2002). All participants were asked the same questions, although the order of the questions was not necessarily the same for each participant. For instance, when interviewing "Bill," question two asked about his metaphor and he did not feel that he could think of a metaphor. He asked if question two could be skipped and revisited at the end of the interview. By the end of the interview, Bill had his metaphor in mind and shared it with the researcher.

Each interview lasted between 30 minutes and one hour because the participants varied in the amount of detail provided to answer each question. The interviews were digitally recorded with prior consent of the participants, and verbatim transcriptions were produced by a third party for the researcher-interviewer to analyze. After the recordings were transcribed by the third party, the transcripts were emailed to the researcher's secure, personal email account. Upon receipt of the email, the transcribed interviews were copied to the researcher's secure, external hard drive and the email was deleted to avoid any breech in confidentiality. Each participant was asked to read over the transcript of his or her interview for accuracy, and then each one was asked if he or she would like to add any further comments to what was transcribed. In each case, the participant declined to add any further detail and communicated that the transcript satisfactorily captured the essence of the interview. The researcher wrote memos throughout the

interview, transcription, and member-checking processes. The transcribed interviews were then entered into the case-study database, and open coded for broad categories.

Within one to two days after each interview, the researcher observed the teacher in his or her classroom. Observational data is considered to be a firsthand encounter with the phenomenon being studied (Merriam, 2002). In each of the observations, the researcher took the stance of complete observer, hence, entered the room prior to the beginning of the class and sat in the back of the room so as to be as unobtrusive as possible (Merriam, 2002). Bogdan and Biklen (2007) explained how important field notes are to the qualitative researcher and this researcher kept detailed field notes utilizing the data collection matrix (see figure 3.1). The focus of the observation was to gather data regarding the participant's teacher dispositions and evidence of his or her conceptual metaphor for teaching. The observation lasted the entire class period of 55 minutes in each classroom. Specifically, the researcher-observer carefully detailed any aspects of the class period that provided evidence of the participant's teaching dispositions and/or of his or her conceptual metaphor for teaching. Additionally, the participant's interactions with the students were also recorded in detail. During the observation, data collection and analysis were occurring simultaneously as rich details from the observational period were written down by the researcher. Specifically, field notes were gathered with knowledge of studies on teacher dispositions and conceptual metaphors as outlined in chapter two. Research memos were written at the conclusion of each observation, and the observation notes were then also open coded. After each observation, the researcher utilized member-checking once again to verify that the researcher's interpretation of the data collected was accurate.

The fifth source of data was collected during the final phase of the qualitative research utilizing the same, semi-structured interview questions in a focus group discussion format that included all four teachers. Merriam (2009) defined a focus group as a method of qualitative data collection that utilizes an interview format with a group of people who have knowledge about the research topic. She explained that a focus group is a proper format when the topic is one that the participants would talk about in their everyday lives. Because focus groups involve several people speaking, there was the potential that the conversations could overlap and therefore become difficult to interpret using only an audio recording device. The researcher decided that it was imperative to capture the rich, meaningful data that would be generated during the discourse, therefore she used a video device to capture the discussion (Wiersma & Jurs, 2009). The video recordings allowed the researcher to hear the discussions and to also monitor facial expressions and body language, which added another layer of rich, thick descriptions to the data analysis (Merriam, 2009; Wiersma & Jurs, 2009).

Merriam (2009) cautioned that a video or audio recorder can create a distraction to the environment of the data collection. To avoid this, the researcher placed the video recorder in the corner of the room such that the participants were not looking directly into the video camera. Creswell (2007) discussed that although participants may be wary at first, once the discussion begins, the participants begin to forget about the presence of the recording devices. The focus group discussion was lively as all four participants shared their comments and it lasted for approximately 80 minutes. The recorded data collected from both the individual and focus group interviews were transcribed verbatim. Upon receipt of the focus group transcriptions, all data collected were coded for themes using

open, axial, and selective coding procedures in sequential steps (Creswell, 2007; Merriam, 2002; Mertens, 2010; Wiersma & Jurs, 2009). Throughout the data collection, the researcher engaged in memo writing which provided an additional data source (Bogdan & Biklen, 2007; Creswell, 2007; Merriam, 2009).

Data Analysis

The final product of data analysis from this research study consisted of an observational, narrative case-study report (Merriam, 2002). Quantitative data from the TDI informed the researcher in writing the narrative accounts as information for the qualitative results of the study. The remainder of the report was generated through deep analysis of the qualitative data that were collected from both types of interviews, memo writing, classroom observations, and verbatim transcriptions (Bogdan & Biklen, 2007; Creswell, 2007; Merriam, 2009; Mertens, 2010; Punch, 2005). The results of the data analysis provided a multi-layered discussion of the significant findings, results, and conclusions of this research study for upcoming chapters four and five (Grbich, 2007; Merriam, 2009; Merriam, 2002). Data analysis procedures are detailed in the following sections: quantitative analyses and qualitative analysis.

Quantitative Analyses

Once the survey data were collected, statistical analyses using SAS were utilized to report mean differences that existed in domains of gender, content area, years of teaching experience, teacher ages, and advanced degrees using ANOVA and *t*-tests. This statistical information was used to answer questions 1-5. The mean differences were compared in each domain between the two subscales of the TDI. The variables such as gender, content area, and degree earned were coded in SAS using a numbering system as

shown in the Table 3.4 below. SAS was also used to compute data regarding the percentages of participation.

Table 3.4. Codes used for analysis of survey data

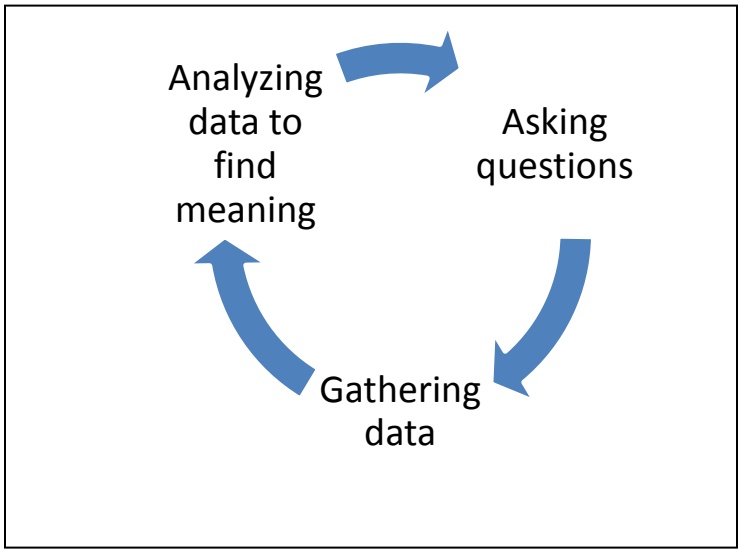
Gender Codes	Content Codes	Degree Earned Codes
Male = 1	Mathematics =1	Bachelor's = 1
Female = 2	Language Arts =2	Master's = 2
	Social Studies = 3	Specialist's = 3
	World Language = 4	Doctorate = 4
	Science = 5	
	Other = 6	

Qualitative Analyses

Creswell (2007) discussed that qualitative data analysis is a way to make sense of the collected data. The qualitative researcher has to approach the data analysis "inductively and comparatively" (Merriam, 2009, p. 175). With a mathematics background, this researcher understood that inductive analysis of the data begins with specific data and moves outward allowing general themes to emerge from the data. Comparative analysis utilizes data units in order to compare and contrast, enabling the researcher to establish similarities and differences (see Figure 3.5). The researcher separated the data analysis into the following modes: organizing the data; using coding methods to generate categories and themes; testing the themes back against the data; and, searching for alternative explanations, Although using both inductive and comparative

analysis techniques (Creswell, 2007; Merriam, 2002, 2009; Yin, 2009). For instance, in chapter five, it is noted by the researcher that Mary's teaching metaphor does not fit the learning view schema of the other participants. The researcher offered evidence from the review of the literature that explained why Mary, having only a few weeks of teaching experience at that point, might have a view of learning that was very different from the other participants who each had seven or more years of experience.

Figure 3.5. The relationship between data analysis, questioning, and finding meaning.



Organizing the data

The process of qualitative data analysis begins with organizing the data by identifying segments that inform the research questions (Merriam, 2009). Identifying these segments serves a two-fold purpose. First, the segments of data that informed the research questions are key to building a rich, detailed case-study database, and, secondly, taking these segments out eliminates extraneous data. To identify these useful data segments, the researcher read each data source through several times in order to become

intimate with the data (Creswell, 2007; Yin, 2009). Completing this initial process of sorting through the data allowed the creation of data units. Merriam (2009) explained that a data unit must be a meaningful segment of data that will inform the research questions. For example, during the course of the field work, there were statements documented that had nothing to do with either teaching dispositions or conceptual metaphors and those were discarded. One of "Donna's" transcriptions included her opinion of disrespectful students. This particular piece of data had no relevance to either dispositions or teaching metaphors; therefore, the researcher decided to discard that unit of data. The resulting data units only contained information that was relevant to the research questions under study.

Coding

Wiersma and Jurs (2009) explained that qualitative research can generate large quantities of descriptive data, and *coding* is a process utilized to organize and reduce the data so that it can be managed, categorized, synthesized, and analyzed in the most accurate way possible. The data sources that were coded included the interview transcripts, member-checking notes, the researcher's field notes from observations and memo-writing, and the open-ended survey items. There were three types of coding employed in this study: open, axial, and selective (Creswell, 2007; Grbich, 2007; Merriam, 2009; Mertens, 2010).

Open coding. The first phase of the coding process involved open coding. Grbich (2007) discussed that when a researcher engages in open coding, it "involves a word by word, line by line analysis questioning the data in order to identify concepts and categories which can then be dimensionalised" (p. 74). Reading and constantly critiquing

the data allowed the researcher to "open" it in a process that involves constant critical induction, deduction, and verification (Grbich, 2007). A process that must occur during open coding is memo writing as a record of identification during the researcher's interpretation of the data. Memo-writing assisted the researcher in documenting the conceptual and theoretical processes of the data analyses (Bogdan & Biklen, 2007; Creswell, 2007; Grbich, 2007; Maxwell, 2005). The memos detailed descriptive record of the researcher's ideas, thoughts, hypotheses, etc., and were another source of data (Merriam, 2009).

In the research study, collected data were initially coded into micro-level categories that specifically signified the constructs that were being studied. Initial code lists were developed for each construct based on the review of the literature (shown in table 3.6). Micro-coding continued to be applied to the data repetitively throughout the initial phases of analysis. For example, at the beginning of the open-coding process, the interview questions focused on two constructs: professional dispositions and teaching metaphors, therefore, based on the research in each area, the initial dispositional codes were based on Combs's (1972) research, and the initial teaching metaphor codes were based on recent research on teaching metaphors (Leavy, 2007; Mahlios et al., 2010; Martinez et al., 2001; Noyes, 2006). Likewise, if the data seemed to indicate a dispositional perception that the participant had about him or herself, that was coded "PT" or "PC" if the data seemed to indicate the participant's perception about mathematics. Teaching metaphors were also initially coded using subcategories that are consistent with the research in that area (Lakoff & Johnson, 1983; Noyes, 2006).

Table 3.6. Initial code lists based on review of the literature

Code	Dispositional Description	Code	Root Metaphor Description
PC	Perceptions about subject matter	TJ	Teaching as a Journey
PT	Perceptions about self as teacher	TF	Teaching as a Force/Structure
PO	Perception of other people (i.e., students, colleagues, parents, administration, etc.)	TT	Teaching as a Container
PTT	Perceptions about the teaching task		

Open coding is completed when concepts and categories provide no new information emerging regarding the properties of the codes and categories (Creswell, 2007). After open coding revealed no new information, the data were then collapsed into macro-level coding that served as general categories for the study's findings (Creswell, 2007; Merriam, 2009). Microsoft Excel was utilized to aid in the open-coding process, and hand coding was also utilized in generating categories, or themes, that emerged during the analysis. Hand-coding allowed the researcher to sort and to keep track of the categories as each was generated during the open-coding process. Merriam (2009) stated that devising the categories during the open-coding process is an intuitive process, but that it should also be "systematic and informed by the study's purpose, the investigator's orientation and knowledge, and the meanings made explicit by the participants themselves" (p. 184). A spreadsheet (Appendix F) was created to organize the data. Initially, a spreadsheet was created for each individual interview and the focus group.

Transcripts of these interviews were cut and pasted into cells with an open code assigned to each. For instance, Bill often used the words “connections” or “relationships” when talking about his students, so initially there was a section for Bill called “student connections.” There were sections that the participants had in common, such as, reflective practice, barriers to teaching, and goals for teaching.

Care was taken in the open-coding process to continue to consider all sources of data. Merriam (2009) reported that although data analyses apply to all qualitative inquiries, there are features of case studies that can affect this. A case-study is an intensive, holistic description and analysis of a bounded unit and communicates an understanding of the case that has to be the chief consideration during the analysis process. The researcher was diligent to revisit each data source and utilized technology to ensure that the management of the data was simplified (Creswell, 2007; Merriam, 2009). Yin (2009) described this process as collecting and building the case-study database. The case-study database assisted the researcher as it allowed the data to be organized topically and categorically, and made retrieval of specific data during the intensive data analysis an easier task (Merriam, 2009).

Axial coding. Axial coding follows open coding as a way to further assemble the data (Creswell, 2007; Grbich, 2007). Often axial coding is presented as visual model, such as a tree diagram, a graphic organizer, or matrix (Creswell, 2007). During axial coding, all data sources and their respective codes were analyzed for the central phenomenon and further analysis was accomplished through revisiting the case-study database. For example, the open codes reflective practice, evaluative practice, and compassion for students were collapsed into an axial code named “Perceptions about Self

(Dispositional).” An axial coding matrix was generated that related various aspects of the case-study (e.g., participants, observations, actions) to the phenomena or themes that emerged from the data. During the micro-coding, the initial codes generated were based on the dispositional research of Combs (1972) and the metaphor research completed by Lakoff (1993) and Noyes (2006). During the macro-coding, the researcher augmented the list based on research by Mahlios et al. (2010) and Martinez (2001). For instance, Mahlios et al. (2010) used the root metaphors in the Lakoff (1993) research, but found that teacher metaphors often included the teacher as nurturer, and hence, added that concept as an axial code.

Martinez (2001) found in her research that teaching metaphors could often be categorized into three distinct views of teaching and learning: (1) Behaviorist: the teacher is the transmitter of knowledge and his or her students are passive participants; (2) Constructivist: the teacher and the student collaborate to construct new knowledge out of existing schema, knowledge; or (3) Situated: the teacher constructs knowledge for the students based on the context and culture in which it is situated. Research in the area of teaching metaphors indicates that a teacher’s belief system plays a key role in both teaching dispositions (Albee & Piveral, 2003; Brookhart & Freeman, 1992; Collinson, 1999) and teaching metaphors (Bullough, 1991, 2010; Chapman, 1997; Martinez et al., 2001; Patchen, 2011; Saban et al., 2007).

During the axial coding process, each participant’s data revealed perceiptions about their belief system in five different areas: (1) prior experiences which led them to teaching; (2) connections to students; (3) their teaching in general; (4) their self-reported dispositions; and (5) barriers to their teaching (see table 3.5). As the researcher examined

the axial codes, it became apparent that the axial code "barrier to their teaching" had only been discussed by Bill and Susan and the individual discussion of barriers had been with regard to their respective teaching metaphors. The researcher decided to include the discussions about barriers in Bill and Susan's dialogue of their teaching metaphors.

Selective coding. Selective coding is the final stage in the coding process (Creswell, 2007). During selective coding, the researcher used the matrices developed during axial coding and formed hypotheses that explained how the categories that emerged were interrelated. Meaning from the categories emerged that told a central story of the case-study that is rich and thick descriptively and reflective of the lived experiences of the participants (Jones & McEwen, 2004; Merriam, 2009).

Bogdan and Biklen (2007) stated that a theme is a key idea or concept that emerges from qualitative data. Often researchers have multiple themes that emerge which serve to focus the findings that are based on the data and the review of the literature. The coding process continued until the researcher found that no other themes emerged and that data saturation had occurred. This intensive data analyses allowed the researcher to answer the research questions using the data gathered and information gleaned during both individual and cross-case analyses. During selective coding, the researcher collapsed two axial codes: perceptions of their teaching in general and their self-reported dispositions. Upon completion of the coding process, three themes emerged from the data that were used to represent potential findings of this research study in the next chapter: (1) personal experience that led to teaching; (2) perceptions about personal factors (dispositions) that impact their teaching; and (3) perceptions about their students.

Validity and Reliability

Validity and reliability must be addressed in any research endeavor. Wiersma and Jurs (2009) asserted the validity expected in educational research may cause problems in qualitative research due to the fact that qualitative research takes place in a natural setting. Furthermore, in case-study research, Merriam (2009) reported that validity refers to not only the quality of the study, but the trustworthiness that all aspects of the study were completed in an ethical manner. Creswell (2007) posited, "I consider 'validation' in qualitative research to be an attempt to access the 'accuracy' of the findings, as best described by the researcher and the participants" (pp. 206-207). To ensure validity and to bolster the credibility and transferability of the qualitative findings, the researcher utilized triangulation of the data, rich, thick descriptions during the analyses, and used five different data sources during phase two of the qualitative portion to strengthen the validity of this study (Merriam, 2005; Yin, 2008). Research-based coding was used and themes were developed using complex, multi-layered descriptions which included memo writing, observations, and member checking at several junctures in the data collection to provide participants the opportunity to have input, providing further validation and credibility of the accuracy of the data during the data collection process (Creswell, 2007; Merriam, 2009; Yin, 2009).

Reliability refers to the likelihood that a qualitative study can be replicated (Creswell, 2007; Merriam, 2009). This is particularly difficult in case studies which involve studying specific and targeted human behaviors due to the fact that these behaviors are not always static. Merriam (2009) further proposed that consistency and "reliability in a research design is based on the assumption that there is a single reality

and that studying it repeatedly will yield the same results" (p. 220). Even though studying human behaviors might yield multiple responses by multiple researchers, consistency is more difficult to achieve. Merriam (2009) contended that reliability or consistency can be further enhanced "if the findings of the study are consistent with the data presented, the study can be considered dependable" (p. 222). Reliability and consistency for this study were bolstered by using a case-study database in conjunction with the quantitative data analyses.

Yin (2009) discussed reliability and consistency in terms of three principles of data collection: (1) utilizing multiple sources of evidence; (2) creating a case-study database; and (3) maintaining a chain of evidence. The first and second principles were discussed in a previous section. The reliability and consistency of this research study is confirmed based on the third principle. The researcher created a case-study database that would provide anyone interested access to all of the data that was generated and any evidence used. The case-study database was created digitally, and organized by folders on the researcher's external hard drive. Field notes that were handwritten were stored in a case-study notebook, and could be scanned to yield a digital copy as well. Yin (2009) reported that in qualitative studies, the purpose of a chain of evidence is to create a pathway from the origins of the case to the final report of the findings. The researcher collected evidence throughout the research process to establish clear and focused processes (see figure 3.7).

Figure 3.7. Case-study chain of evidence

Limitations

This study is confined by its scope and limited sample size. A sample of convenience, due to district restrictions on quantitative research, dictated that the survey could only be administered to the teachers in one high school. The inability to survey multiple schools within the district and/or within the state further limits the study. The small sample size from the limited population of teachers at one school poses threats to external validity, as well as limiting the statistical power in order to detect significant differences. The extent to which the study can be generalized to other groups will be limited given the small sample of convenience, as well as the fact that this study was conducted in a suburban area with a small population of students who are eligible for free and reduced lunch. The current study requires replication in order to obtain better generalizations to rural, low socioeconomic status (SES), and urban areas. It is important to note that utilizing a purposeful sampling in the qualitative examination also limits the generalizability of this portion of the study. This study is also limited by the fact that the survey instrument utilized was designed and developed to assess preservice teachers, not inservice teachers.

Ethical Considerations

Prior to beginning the study, the researcher gained the permission of the high school principal according to district guidelines for conducting research. The researcher

then filed the appropriate paperwork with the university's IRB department and was given approval to conduct the study prior to contacting any teacher regarding participation. The participants in this research study did so voluntarily and each of them indicated their consent prior to participation. The survey was administered via an electronic tool and all of the quantitative procedures were planned so that the researcher was not involved on a personal level. The open-ended and semi-structured questions that comprised the qualitative piece of the study did not ask for sensitive information. By using pseudonyms and a secure electronic storage system, the confidentiality of the participants was maintained at all times during both phases of this two-phased study. The researcher employed specific measures to maintain the confidentiality of the participants' names, demographic information, as well as any input from the participants. The results collected from the survey, and well as the case-study database were stored on the researcher's password-protected external hard drive. In the qualitative phase, pseudonyms were assigned to each of the participants and used throughout the write-up of the analyses. No identification of names and/or information was asked for during the interviews, and the digital audio and video recordings were erased once the transcription processes were completed.

Role of the Researcher

As the primary collector of data, the researcher's role was that of researcher-interviewer, and in the classroom observations as researcher-observer (Creswell, 2007; Grbich, 2007). The researcher's expertise is in secondary mathematics content, curriculum, and instruction. At the time of the study, she had attained a specialist's degree in secondary mathematics education, was certified by National Board of

Professional Teaching Standards in adolescent youth and adult mathematics, and was enrolled in a doctoral program in educational leadership for learning. At the time of the study, the researcher was a 46-year-old, White female with 17 years of teaching experience in two different states. The researcher had worked at the high school under study for 12 years, was working as a member of the administrative team, and also chaired the section 504/Student Support Team (SST) department. The fact that the researcher worked at the school and was familiar with the participants provided a unique perspective; however, the researcher maintained an awareness that bias can result when the researcher is also the interviewer, and this bias can affect the generalizability of the findings. Because the researcher was employed at the school and had a good rapport with the participants, there was also the possibility that results would be gained through selective attention to details and selective interpretation of data. An additional concern was that the researcher chose the participants because of expectations of responses in particular way. Throughout the research process, the researcher relied closely on the guidance of the dissertation committee to assist in minimizing these limitations.

There are 21 mathematics teachers in this high school; however, the researcher purposefully invited four of them to participate based on the demographic data by gender, age, years of experience, and/or highest earned degree in order to maximize the variation and diversity of the participants. To prevent bias in data collection, and to better ensure internal validity, the researcher utilized member-checking after each of the transcription process to validate that the interviews were transcribed accurately. Member-checking is a method that qualitative researchers use to help ensure credibility (Bogdan & Biklen, 2007; Grbich, 2005). Indeed, the researcher's familiarity with the participants potentially

strengthened the data collection. A preexisting rapport with the participants allowed for more natural conversations, where the participants may have shared more willingly, and in greater detail regarding their experiences (Bodgan & Biklen, 2007).

Summary

This chapter restated the purpose of this research and presented the research questions and hypotheses. The participants were chosen using a sample of convenience of 144 certified teachers at one high school with a population of 2,627 students. The design of the study was detailed, and the instrumentation was discussed, including information regarding validity and reliability. Data collection procedures were identified and outlined and a time frame was specified. All aspects of data analysis were discussed. Chapter four will present the results and implications of this study assessing the dispositions of inservice teachers and mathematics teachers' perceptions of dispositions and conceptual metaphors of teaching.

CHAPTER 4

RESULTS

The purpose of this study was to determine if a relationship exists between mathematics teachers' professional teaching dispositions and their metaphors for teaching. The research for this study was conducted in two phases. In the first phase, the researcher sought to determine not only the dispositional stance of high school teachers, but also to use quantitative measures to determine if significant differences existed specifically in five demographic domains: gender, age, highest earned degree, content area, and years of experience. To best answer the research questions in phase one, the Teacher's Dispositional Index (TDI) was employed to survey the participating convenience sample of high school teachers. Quantitative data were analyzed via descriptive statistics acquired using SPSS and SAS software. The second phase of the study utilized qualitative methodology to gather case-study evidence from four purposefully sampled cases using the following protocols: open-ended survey items, semi-structured interviews, classroom observations, memo writing, and a focus group discussion. The qualitative data were analyzed utilizing open, axial, and selective coding, which was accomplished by the researcher using hand coding and a matrix which was developed using Microsoft Excel (Appendix F).

This chapter is presented in two sections that outline the findings of each research phase as they answer the related group of research questions. The first section discusses the findings from the quantitative analysis of participants' answers on the TDI and the

second section discusses the relevant findings from the qualitative case studies on high school mathematics teachers. The qualitative findings of this study will be provided using rich, thick descriptive narratives of the participants' thoughts, behaviors, and discussions as observed and interpreted by the researcher. There are times when the researcher will make inferences to bridge the differences between the review of the literature presented in chapter two and the actual data described in this chapter (Creswell, 2007; Wiersma & Jurs, 2009; Yin, 2008).

Phase 1: Quantitative Research Results

This section discusses the findings of the quantitative data in order to answer research questions 1-5, which guided phase one of the study:

Question 1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus teacher-(professional/curriculum) centered stances?

Question 2: Are there significant differences in the dispositions of inservice teachers based on gender? If so, what are the differences?

Question 3: Are there significant differences between the dispositions of teachers based on years of experience? If so, what are the differences?

Question 4: Are there significant differences between the dispositions of teachers based on their age? If so, what are the differences?

Question 5: Are there significant differences between the differences of mathematics teachers and other content areas? If so, what are the differences?

Quantitative data were collected from the convenience sample of high school teachers using the TDI (Schulte et al., 2005).

Factor Analysis of the TDI Instrument

The initial factor analysis (Schulte et al., 2005) indicated that a two-factor solution fit the data. The two factors accounted for approximately 69% of the variance in the TDI items. Using a factor loading cutoff value of .50, the factor loadings for the two-factor solution revealed that the TDI items measured a student-centered dimension and a teacher-centered dimension. Nineteen of the original 64 TDI items that loaded on both factors were removed so that each retained items that loaded on one and only one factor. This was necessary because the original researchers wanted to construct two relatively independent composite scores. Thus, the results of the factor analysis yielded a 45-item TDI that measures two unique constructs.

Reliability Analysis of Disposition Instrument

For the reliability analysis of the Teacher's Disposition Instrument (TDI), Schulte et al. (2005) calculated a Cronbach's alpha for each of the two TDI subscales: a student-centered stance and a teacher-centered stance. The TDI was developed as a quantitative instrument designed to measure preservice teacher dispositions as specified by the 2002 INTASC principles. The 45-item TDI is classified into two distinct subscales: student-centered, with 25 selected-response items, and teacher-centered (professionalism/curriculum), with 20 selected-response items. The subscale item statements are a mixture of self-descriptive professional attributes of belief statements, with which the respondents have five Likert-scale options: (1) strongly agree; (2) agree; (3) neutral; (4) disagree; or (5) strongly disagree. The reliability estimate for the 25-item student-centered subscale was .98. The reliability estimate for the 20-item teacher-centered subscale was .97. Prior to emailing the instrument to the inservice teachers, item

number four was removed due to a request of the high school principal. Item four stated: "I uphold the laws and ethical codes governing the teaching profession." The principal's concern with this item was that if a teacher selected either neutral, disagree, or strongly disagree, it would put the teacher in violation of the teaching contract signed with the district.

Reliability and Validity Analysis of the Two Subscales

The initial survey items that were reviewed for content validity numbered 100. There was a three step process for retaining and/or revising items based on input from the content validity panel. A pilot study was conducted prior to the current research in order to establish the reliabilities of the subscales. Reliabilities and alpha coefficients, within an accepted range, were generated for the current study.

For the subscale student-centered stance, the alpha coefficient is .86. The alpha coefficient for the teacher-centered subscale is .89. The data were examined to verify if the assumptions for parametric tests were met. The data did not meet these assumptions, as it was determined that there was a non-normal distribution. Therefore non-parametric tests were utilized, in particular the Satterthwaite method in SAS.

Results of Statistical Tests

Contrary to expectations, only the test with regard to gender was found to be significant, t (21.728) = -2.26, $p < .05$ (See figure 4.1). The female teachers (M = 4.74) scored significantly higher on the student-centered subscale than the male teachers (M = 4.54).

Figure 4.1. Output data for gender.

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	50	-1.93	0.0587
Satterthwaite	Unequal	21.32	-1.62	0.1206

The only other comparison that was close to significance was the years of teaching for the teacher-centered subscale, where the mean for the teachers teaching the longest (M = 4.83) was higher than the teachers with the fewest years (M = 4.52) of classroom teaching (p = 0.077*).*

Phase 2: Qualitative Research Results

The second phase of this research study was conducted using a qualitative research paradigm. Specifically, the researcher sought to determine if a relationship exists between mathematics teachers' teaching dispositions and their conceptual metaphor for teaching. Research in mathematics education will typically have two primary research subjects: the teacher or the student (Chapman, 1997). In this study, the primary research subjects are four mathematics teachers. Prior to the qualitative phase, each of the four participants had submitted their responses online for the Teacher's Disposition Index. The dispositional stance of each one was calculated using descriptive statistics. Three of the participants (Donna, Bill, and Mary) scored higher on the student-centered dispositional stance, and one participant (Susan) scored higher on the teacher-centered stance. The purpose of this section is to provide rich, thick descriptions of each individual

case. The chapter will conclude with a cross case analysis in order to answer the four research questions guiding the qualitative phase of the study:

Question 6: What are mathematics teachers' conceptual metaphors of teaching, and what is the connection between their metaphors and dispositions?

Question 6.1: What are the differences in mathematics teachers' conceptual metaphors and dispositions when considering differing demographics of gender, age, years of experience, and/or highest earned degree?

Question 6.2: What is the relationship between mathematics teachers' expressed metaphors and their instructional practices or models?

Qualitative data were collected from each participant using five sources: individual interviews, a focus-group interview, field notes of observations, member-checking, and the researcher's memos during the research study.

Participant Profiles

The participants in phase two of the study were purposefully selected from the 52 teachers who answered the three open-ended questions at the end of the online survey. Of the 52 teachers, 13 identified themselves as math teachers, and four of the 13 mathematics teachers were asked to participate in the qualitative phase of this study. The researcher purposefully selected mathematics teachers who best represented the range of demographic categories. Each participant's demographic information is described in Table 4.2. Once the participants were selected, the researcher made arrangements with each one to conduct an individual interview, a classroom observation, and a focus group discussion. Research memos were recorded after each series of data were collected to add an additional data source (Creswell, 2007).

Table 4.2. Phase two participants' demographic information

Teacher Pseudonyms	Gender	Age	Yrs of Exp	Degree Earned
Bill	Male	35	7	M.A.T.
Susan	Female	53	23	M.Ed.
Donna	Female	57	7	B.S. Ed.
Mary	Female	23	< 1	BS in Mathematics; Enrolled in M.A.T.

Bill

Bill is a White male in his mid-30s, and had been teaching for seven years. Bill earned a degree in business finance and worked in the business field after graduating college. He reported that he became a teacher because he hated his old job and was jealous of his wife's job as a teacher. His wife is a high school science teacher and he stated that she loved her job. At the time, the state department of education had just enacted a new certification policy to entice individuals with degrees in other areas to earn a master's of arts in teaching, which would allow them to become certified to teach. Bill passed the state's teaching licensure test in the content of secondary mathematics and earned a provisional certificate, which allowed him to teach during the time that he was pursuant of his master's degree. Bill could be described as enthusiastic. He reported that he loves teaching and cannot imagine ever doing anything that gives him the personal satisfaction in his job that teaching provides him. Bill scored higher in the student-centered dispositional stance as compared to the teacher-centered stance on the Teacher's Dispositional Index (TDI) distributed during the quantitative phase of the research.

Susan

Susan is a White female and is in her early 50s. Susan is the mathematics department chair at BRHS. She earned a degree in chemical engineering and worked in that industry until her children were born. She reported that she was a stay-at-home mom for seven years, and then decided to get a teaching degree because it was a "family-friendly" career choice. In the state where she lived at the time, it was possible to get a master's of education degree. With her engineering background, she decided to earn her master's of education in teaching secondary mathematics. Susan is reserved and did not talk as freely as some of the other participants in the focus group discussion. Susan scored higher on the teacher-centered dispositional stance as compared to the student-centered on the TDI which was distributed during the quantitative phase of this study.

Donna

Donna is a White female who is in her late 50s. Donna reported that she had known that she wanted to be a teacher since she was a little girl. When she started college after high school, she enrolled in a teaching program, but a family crisis caused her to drop out of school. She began working for a local dentist, attended the local community college, and earned a dental hygienist certification. She worked as a dental hygienist for five years and then started her own business as a financial analyst and stock broker. During the next 20 years, Donna married, raised two children, and ran a very lucrative business. She stated that in an interview that she never forgot how badly she wanted to be a teacher. When she sold her business to retire, she decided to enroll in a teacher education program and earned her secondary mathematics certification. Donna started teaching at age 50 and has been teaching for seven years. She reported that it is the

happiest that she has ever been while working. Donna often got emotional in the interviews when speaking of her love for teaching and for her students. Donna scored higher on the student-centered dispositional stance as compared to the teacher-centered one on the TDI during the quantitative phase of this study.

Mary

Mary, a White female, was in her first year as an inservice teacher, and is the youngest member of the participants. At the time of the study, Mary had only been teaching a few weeks. Mary earned her bachelor's degree in pure mathematics and is pursuing her master's of arts in teaching, with an emphasis in mathematics. She reported that she was not sure that she wanted to be a teacher, but was having a hard time finding a job in the field of mathematics. She has taught and coached swimming since she was 15-years old, and said that she enjoys being around children. She decided to accept a teaching job at BRHS after being unemployed for a year after graduating college. She described herself as self-reflective. Mary scored higher on the student-centered dispositional stance on the TDI.

Exploring Relationships Between Mathematics Teachers' Metaphors of Teaching and Teaching Dispositions

When used in the context of teacher education, metaphors are more than just a figure of speech meant to compare one thing to another (Leavy et al., 2007; Mahlios et al., 2010; Noyes, 2006; Patchen & Crawford, 2011; Saban et al., 2007). Metaphors for teaching can be the basis of how teachers make sense of teaching and learning, and are impacted by the beliefs and assumptions teachers bring with them to the classroom (Bullough, 2010; Chapman, 1997; Martinez et al., 2001; Patchen, 2011; Saban et al.,

2007). In the past two decades, researchers such as Mahlios et al. (2010) contend that because teaching metaphors are impacted by the belief systems that teachers hold regarding teaching and learning, value is added to the research when teaching metaphors are identified and used to understand how teachers teach and work in the classroom environment (Leavy et al., 2007; Martinez et al., 2001; Patchen & Crawford, 2011). Teaching metaphors have been further categorized into three domains of how they depict teaching and learning: (1) a behaviorist perspective; (2) a constructivist perspective; and (3) a situated learning perspective (Leavy, 2007; Mahlios et al., 2010; Martinez et al., 2001; Noyes, 2006; Pachen & Crawford, 2011).

In this research study, participants framed discussions about their teaching metaphors and dispositions in personal experience, pedagogical beliefs, and philosophy. Participants were asked to share their metaphors for teaching and their teaching dispositions with the researcher in individual interviews. After completing the interview, the researcher observed each participant for a 55-minute class period. The final opportunity to collect data occurred in a focus group discussion, wherein the participants were asked to discuss with one another their teaching metaphors, their dispositions, and whether their dispositions impacted the teaching metaphor, or vice versa. Before discussing the themes that emerged from the data, it is important to outline and discuss each participant's metaphor, as well as the metaphor's ontological mapping and how it was classified according to how it depicted the teaching process. During the interview process, the participants self-reported their metaphor for teaching. Next, the researcher created an ontological mapping for each metaphor (Lakoff, 1993). Based on research and

using the ontological mapping, the researcher classified each metaphor as to how it depicted the teaching process (Leavy et al., 2007; Martinez et al., 2001; Noyez, 2006).

What Are the Metaphors of the Four Mathematics Teachers?

When first asked, Bill did not have an answer for the teaching metaphor question. When he was asked to think about defining his teaching as a metaphor, he said:

> Researcher: Are you familiar with the concept of teaching metaphor?
>
> Bill: Well, I know what a metaphor is…it's like comparing two things…
>
> Researcher: Yes. If you had to define your teaching as a metaphor, what would it be?
>
> Bill: ummm...my own personal teaching or teaching as a profession?
>
> Researcher: No, your teaching…
>
> Bill: ummm…oh (sigh)…gosh, is it possible to come back to this question? (Bill, personal communication, September 15).

It was apparent that Bill was uncomfortable with this question. He discussed at length how important it is for him to build relationships with his students, as well as how much time and effort he puts into constructing lessons for the students:

> My plans are very rough, because I like them to be geared to the student…
>
> Constantly giving, giving time, giving everything that you can if you really care about the student. So that incorporates the love, how much you give. I like it… So [the students] will be interested in the content that we're trying to teach, but content is a small portion of what we do, so. (Bill, personal communication, September 15, 30)

When asked about his teaching dispositions, Bill said:

> I see a connection between my dispositions and my teaching metaphor…which I feel is like the same thing. Or maybe I can't separate the two… because I'm thinking of my metaphor and I'm thinking of my disposition. (Bill, personal communication, September 15).

As he continued to answer the interview questions and to reflect, Bill's teaching metaphor began to emerge. Before the end of the interview, Bill proclaimed:

> I'm thinking it's [teaching] like a newly formed river, because my teaching methods constantly change…so it's like this river that is going along…and I don't always know where it is going…but, it's going down the right path…because all rivers flow to the ocean. The ocean would be mathematical knowledge, my goal for the students. (Bill, personal communication, September 15).

Bill went on to describe how different aspects of his teaching could be described in terms of the metaphor that his teaching is a river:

> That's good. I had no idea when I first got asked [about the metaphor]… so it kind of just formulated in our meeting. But, I was thinking, um, that my goal is to educate the students on math. So that's [goal of teaching] this ocean and I am…like on a boat and my teaching is like this path to get there [to the ocean]. And I constantly have boulders where there's these things [barriers to teaching] put up to keep me from getting there. Sometimes there are lakes or these little divides and I constantly have to weave in and out this path this downhill stream. I see the goal, the ocean and I need to get myself and the students there so they can learn math. That's the ultimate goal, no matter how much junk we have to weave

> around. That's kinda how I saw teaching. (Bill, personal communication, September 30).

As Bill continued to talk about his metaphor, he also created a verbal ontological mapping of "teaching is a river" (Lakoff, 1993). For instance, Bill said "The ocean would be mathematical knowledge" (Bill, personal communication, September 15). Bill mapped the ontology of teaching onto the ontology of a river. The goal for Bill's teaching is mathematical knowledge and the goal for a river is to reach the ocean. As Bill talked out his metaphor, he commented "It's [his teaching metaphor] so clear-cut and defined. So, now I am talking about teaching in metaphors." (Bill, personal communication, September 15). Bill also extended his metaphor to talk about how the barriers that he perceives in teaching would be interpreted through his teaching metaphor:

> So the student would be, like if I'm the river flowing down and I'm navigating the path and which path is like the lessons. I need to take the path to the ocean [mathematical knowledge] for the student to ultimately achieve the goal [mathematical knowledge]. Then, then the whole landscape is students but it's so complex. I mean there is not just one student…and sometimes other students can be obstacles… but sometimes the obstacles can be administrative things that are going on. … taking my time away from what I feel is necessary for my students, but it's like how can you negotiate your river to navigate through… by asking the right questions and doing the right things… which will ultimately get you to the goal and that they [the students] are learning mathematics. With what's going on in our school we are bombarded with all this extra administrative stuff. And I feel like it's getting in the way of what my goal is. Not just that it's the more kids …in

> math like there's 35 kids … …but when there's 35 and you are asking people in your honors class to move from the front to the back. And they don't understand, and the people in the back don't want to be moved to the front… and it becomes more and more frustrating. More of my obstacles, and I just want them all broken down, so I can get there [teaching goal], whether it's a smaller classroom size or less administrative work. Just so we can do the job we were set out to do loving math, breaking down the stuff and getting to what we are trying to get to… (Bill, personal communication, September 30).

Susan seemed to know right away what her teaching metaphor would be and she did not hesitate in giving her answer to the teaching metaphor question.

> Researcher: If you had to define your teaching as a metaphor, what would it be?
>
> Susan: I'm like this person who is maybe like this…scientist who can take… this area of science and bring it down to everyday people…everyday language…so that they…maybe my audience [students] understand it and that's how I see myself teaching. I take something very abstract, very difficult and make it very doable for a student. (Susan, personal communication, September 19).
>
> Researcher: How does this metaphor relate to your classroom and teaching?
>
> Susan: … like a high level Scientist and they can tell you what's going on about a complex subject? And everybody…the common person gets it. What I think of it is I can something so higher order and you can bring it down to where the kids can get it. That's I sort of, that's the way I think of myself, you know, trying to emulate that.

> …if I [as the teacher] am this high, you know Physician or Physicist and I'm able to explain something and…the general public [her students] is able to grasp it and maybe somebody…said it really made a lot of sense. I feel that's how I model things in my teaching. (Susan, personal communication, September 19).

Susan also indicated that Advanced Placement testing and the subsequent scores are a barrier to her teaching:

> I just can't do their learning for them... I mean the high stakes test. Gosh, I would like to see everybody do well. That's the bottom line. My AP class I want them to do well I want to work with them and help them get through it. Gosh, I want them to all pass. When we get the scores back and the students passed…that's the best feeling I have. (Susan, personal communication, September 30).

At the end of the interview, the researcher asked Susan if she thought her metaphor might change over time, Susan said:

> I have a different perspective [being a department chair] as well as a math teacher, because I see other people teaching. It's almost as if I know what works and what doesn't. Because, I have seen classrooms falling apart and I've seen classrooms that are like a well oiled machine….because of that my metaphor won't change. (Susan, personal communication, September 19).

Donna could also define her metaphor of teaching. In her answer, she extended the teaching metaphor allowing the researcher to create the ontological mapping. Donna stated:

> Well, I think teaching is love. That's what I think of when you said that. Teaching is love, I mean if you love kids and you love teaching then giving students

> knowledge is like giving love. The recipients of the love [my students], and some days when you give the love, you get it back. And when that happens, it makes my whole day. (Donna, personal communication, September 15).

During the observation of Donna's classroom, the researcher noted that Donna exhibited loving gestures towards the students:

"As the teacher walks around the room, she pats various students on the back and/or rubs their shoulders as she passes by each desk. The students seem to be accustomed to the teacher's gestures as they continued to work and the physical touch from the teacher did not appear to be distracting for any of the students." (Donna, field notes, September 21).

Mary was asked the same question as the other participants. She indicated that her graduate class had talked about teaching metaphors that week by saying "We talked about this [teaching metaphors] in one of my graduate classes. Actually, we talked about a couple of different ones and archeologist was the one that stuck out to me" (Mary, personal communication, September, 16). When asked to elaborate on how her teaching metaphor is reflected in the classroom, Mary laughed and said "For this metaphor, I think it was really more about the teacher digging things up and finding what works and what didn't, finding what is important and wasn't important" (Mary, personal communication, September 16). Mary elaborated on the metaphor by adding:

> Also, teachers have to document those things [instructional methods that work or not], like an archeologist would do, discussing and discovering different things that work…important concepts. I think the students are there for me to "dig up" too…find out about the student, maybe the student is quiet so try to pull things

and find out what works for that student and stuff like that. (Mary, personal communication, September 16).

Using data from the transcriptions of the individual interviews, the focus group discussion, as well as the field notes from the observations and memo-writing, the researcher developed a matrix that recorded and categorized each participant's teaching metaphor, its ontological mapping, and what became crucial to the summary of the findings, the metaphor's classification as a either a teacher-centered or student-centered (see Table 4.3).

Table 4.3. A summary of the classifications of the participants' metaphors for teaching

Participant	Metaphor for Teaching	Ontological Mappings	Depiction of Teaching/Learning
Bill	A River	Teacher = Boat navigator Student = Boat passenger Mathematical Knowledge = Ocean Barriers = Obstacles (rocks, topography, etc.)	Student-Centered
Susan	High-level scientist in front of audience of non-scientists	Teacher = High-level Scientist Students = Audience	Teacher-centered
Donna	Love	Teacher = Giver of Love Student = Receiver of Love Mathematical Knowledge = Gifts of Love	Student-Centered
Mary	Archaeological Dig	Teacher = Archaeologist	Self-Referential*

Note: Leavy et al. (2007) defined the term self-referential to indicate a metaphor that preservice teachers used to describe the act of teaching, or teacher, and did not include meaningful extensions to the students, classroom, or any classroom resources.

Connections between Mathematics Teachers' Metaphors and Their Dispositions: The Emergence of Themes Related to Belief Systems

The literature indicates that a teacher's beliefs and assumptions about teaching and learning will impact his or her dispositions towards teaching (Albee & Piveral, 2003; Brookhart & Freeman, 1992; Collinson, 1999). Teacher dispositions form the basis of teachers' thoughts and actions which are essential for teaching excellence (Giovannelli, 2003; Helm, 2006; Levin & He, 2008; Phillips, 2007; Su, 1992; Wayda & Lund, 2005), and empirical evidence indicates that effective teaching is the best way to positively impact student achievement (Albee & Piveral, 2003; Giovannelli, 2003; Helm, 2006; Levin & He, 2008; Wayda & Lund, 2005; Whitsett et al., 2007). Research in teacher education supports the premise that teachers have their own views and belief systems which impact their thinking and behaviors of teaching; therefore, it is important to understand the influence that a teaching metaphor plays on their teaching practice (Patchen & Crawford, 2011; Yung, 2001).

When asked in the individual interviews, if Bill thought his dispositions play a role when planning his curriculum, Bill said, "Disposition? Is that like how I prepare for the lesson or actually what the lesson will look like, or both?" (Bill, personal communication, September 15).

When asked if she thought her dispositions play a role when planning her curriculum, Susan answered:

> Now, I don't I used to [write daily lesson plans]…way back when I first started teaching. But, now it's [teaching] so automatic. I still keep an overview plan, it

> keeps me organized so I will know when to schedule quizzes, or tests. (Susan, personal communication, September 19).

When asked the same question about whether her dispositions play a role in planning her curriculum, Donna answered:

> My disposition is to not always think that I'm perfect. I try to show it in class all of the time, because I don't want the kids to think that they have to be perfect. I want them to know that it's okay to make a mistake…it's okay to be wrong sometimes. (Donna, personal communication, September 15).

When the question regarding dispositions playing a role in her curriculum, Mary shared how she values reflection when she is planning her lesson activities:

> I think about my teaching all the time…driving…eating…even while I am teaching. I am trying to figure out what works and what doesn't. As a new teacher, it is hard sometimes, to balance everything…the planning, the grading…but I am constantly reflecting…watching the students faces. Sometimes, they are so hard to read…I want them to really, really understand math…to love it like I do…and I think that will come if they feel good about what they understand. (Mary, personal communication, September 16).

Research strongly supports that a preservice teacher's belief system is typically based on three sources: (1) family background and K-12 experiences as a student; (2) observations and teaching experience (either in preservice or inservice); and (3) teacher education coursework meant to challenge preexisting belief systems (Darling-Hammond et al., 2002; Helm, 2006; Katz & Raths, 1985; Levin & He, 2008). Likewise, a teacher's belief system can influence his or her classroom practices and therefore, the various

opportunities for student learning (Levin & He, 2008). A study by Book and Freeman (1986) reported findings to support that those who aspire to be teachers often have similar belief systems, and that students who enter secondary mathematics tract are more likely to have taken advanced courses in mathematics than someone in the elementary teaching pathway. The following sections document what the qualitative data revealed about the participants' belief system in the following three themes: (1) personal experience that led them to teaching; (2) perceptions about personal factors (dispositions) that impact their teaching; and (3) perceptions about their students.

Personal Experiences That Led Participants to Teaching

When asked what life experiences had led him or her to choose teaching as a career, all four participants indicated that they were on a different career path initially. Bill had a business/finance degree and worked in sales, Donna had been a dental assistant and then owned a stock broker and finance company, Susan had been a chemical engineer, and Mary had graduated with a degree in mathematics (not an education major). Bill and Susan both had similar accounts of how each had decided to return to graduate school to earn a Master's degree in order to attain a teaching certificate. When asked what life experiences led him to choose teaching as his profession, Bill said:

> Sometimes, I can't believe that I love teaching so much…it's like my favorite thing to do…and I was so against teaching when I was younger. Now…looking back on the jobs that I had before becoming a teacher…in each one, I was in a teaching role of some sort. Training my employees, mentoring the management trainees, and building relationships with my clients… But it really clicked with me that I wanted to teach when my wife started teaching science at [a local] high

> school…she loved it, and would come home telling me stories…and I wanted to be that happy with my job. (Bill, personal communication, September 15).

Likewise, Susan shared what life experiences had led her to choose teaching as her career by saying:

> …I was often asked to lead tour groups through the chemical plant. I think it was because I was one of the only women who worked there and most of the men did not like leading the groups. But, I did not mind it…really, I enjoyed it. I especially liked when high school groups came through on the career days. When my sons were born, I started working part-time at the plant, and I missed the interaction with people. I met this other mom on the playground one day and she was a teacher. We became friends and she is really why I decided to get a degree in teaching. I was an engineer, and so I had taken a lot of math…the education courses were actually fun. Besides, twenty years ago…teaching was very family friendly. I had the same hours as my sons and that was nice. (Susan, personal communication, September 19).

In contrast, Donna and Mary each reported having wanted to be a teacher when they first entered college. Donna discussed how her plan had been to be a math teacher since high school:

> …I was in school to be a math teacher when I was 18 years old. Due to family circumstances…I had to drop out and get a job. I cannot explain it, but in the back of my mind, I always thought about being a math teacher. At age 50, I went to my husband and said I want to be a math teacher. It's always what I wanted to do, and I am going back to school. (Donna, personal communication, September 15).

Mary's story was very similar in that she reported that she had always wanted to be a teacher as well. Mary shared:

> I had taught or coached swimming since I was 15 years old and I always thought that I would be a teacher. But in high school, I was really good at math and so I just took a lot of math classes in college. Before I knew it, I had enough to graduate with a degree in mathematics. Yeah, I always wanted to teach… I actually interviewed for a position here, right when I finished for the one that opened in January, but I wasn't certified to teach. So I got all of my certification done and I'm getting my masters. (Mary, personal communication, September 30).

Personal Factors (Dispositions) That Impact Teaching

All of the participants talked about personal factors of their teaching when asked if they saw a connection between their teaching metaphor and dispositions. Although individually, the participants talked about personal factors when discussing their perceptions of the connection between the teaching metaphor and dispositions, the focus group discussion revealed three key areas that these teachers focus on in their classroom: (1) effective teaching; (2) planning and preparation; (3) reflective teaching; and (4) evaluative feedback.

Effective teaching strategies. Several of the participants shared through the interview their perceptions of the types of instructional activities that lead to effective teaching. Questioning was the area that was discussed. Bill indicated that he learned the value of questioning to helping his students to understand the content better:

> So you [the teacher] constantly ask questions… a major part of being a successful teacher and liking your job is being able to read [student] faces. You are constantly looking and you're seeing that they don't get it. I didn't know [how to use questioning] until my 4th or 5th year teaching. Because after my 2nd year, I remember thinking to myself… I shouldn't be answering so many questions, I need to be asking them [the students], well what do you think you should be doing? …it's really about asking the questions…So I know that I have to get them [students] to draw graphs, polynomials to deal with end behavior and know cubics but I will let them lead it. …now, they [the students] will ask questions and say, "well what happens if there's…" or "can you have one complex solution?" or "why can't there be only one complex solution?" (Bill, personal communication, September 30).

Susan uses technology very effectively in her Advanced Placement Statistics class.

> And Susan has the students working on a worksheet and is teaching not only the statistical processes, but also how to use the calculators…and everyone has their calculators going. I mean, she talked about being this high level scientist and working with breaking down high level content and making it understandable in her metaphor…and she has the kids doing it…they are understanding…most of them. The ones who don't feel safe in this environment and are asking questions. She has made very high level content understandable and the students were doing a great job. (Researcher's field notes, September 19).

Mary agreed with Bill about the importance of questioning and how she is learning to use questioning in her lesson delivery:

> I feel like I ask too many questions. I mean I do that a lot. I'm asking and we [as a class] get into discussions about it… One person asks a question and another person is talking. So they ask the same question and I have to try and not get frustrated… I just went over this and I want everybody to get it…And that's why I have to take a step back, be patient and just be like ok and continue teaching … and then I'm like [off topic]… oh we have to finish [the lesson]… (Mary, personal communication, September 30).

Planning and preparation. The participants also talked about how planning and preparation of the mathematics lesson leads to effective teaching. There were differences in how the participants planned for instruction. Bill said:

> For me, it's about preparing great lessons rather than the documentation of what I am going to do in class…when it comes to actual planning, I want big picture things…to know where they're struggling and what can I do to bridge the gap…get them to do more repetitions of the problem" (Bill, personal communication, September 30).

Susan responded to Bill by saying "I am never the type of person to teach off the cuff. It's not organized…when a lesson is done properly it runs like a well oiled machine…" (Susan, personal communication, September 30). Bill followed by saying to Susan:

> …maybe you get better engagement from the students. My plans are very rough, because I like them to be geared to the student. I know what problems I wanna go through and I have an idea of how I will take them through it, but when I have a structured lesson plan like where I'm gonna do this [an activity] for the first ten

> minutes and I have to move on then I find those have actually been some of my worst lesson plans. (Bill, personal communication, September 30).

In this particular high school, collaborative planning is expected by the administration. The participants brought this up in the focus group, and Bill talked about how teaching dispositions can impact collaborative planning with other teachers. Bill stated:

> … that's, one of the problems, and I see it the most when I am planning with other teachers. I think you align and wanna plan with teachers that have more of a similar disposition as you. Because when you don't and they [teachers] are doing things that are maybe more structured and organized. If it's not how you would do it or that's not how you would carry on the lesson…it's frustrating to try to plan with a teacher like that. Because, they're expecting things from you that you wouldn't typically do. And then if you do use them [the common plans] and you feel like you are wasting time. (Bill, personal communication, September 30).

Reflective practitioner. Several of the participants shared the reflective nature of their teaching. Susan emphasized the importance of being reflective:

> I think we [math teachers], being logical thinkers we are logically thinking through our classrooms, we are evaluating, we are reflecting, We logically think through our methods… There are other disciplines that just want them [students] to feel good. And if [the students] feel good about it then that's enough for them… but we really want [students] to get it. That's why we know if they don't get it … we are really focused on that end product. (Susan, personal communication, September 30).

As Bill spoke of reflection, he interjected an extension of his teaching metaphor, teaching is a river. He said:

> …you feel like you have straightened the stream down..I don't know if that is always the best. So I am constantly trying…and after I reflect I am like maybe I can lay this with cement, you know to make it go faster. (Bill, personal communication, September 30).

Donna added "You think it's going downhill and then you get your test scores back and then you're like…oh my gosh…I thought is went so well. How did they [students] not get that?" (Donna, personal communication, September 30) To which Bill responded "…gosh, why are they missing this?...cause it offends me. I take it so personally and I feel like I failed them." (Bill, personal communication, September 30). Donna followed that statement with:

> …the reflection part. I don't think that I'm as good at that. I just need to sit down and think about what works and what doesn't. I mean, I know that I do that, but not on a conscious level. I need to do more and do better at that [reflection] (Donna, personal communication, September 30).

Mary also interjected:

> I was thinking that today…about reflecting… sometimes I wish I could go back to first period class again and at the end of the day. I wish I could just rewind the day…just go back, because by the time I had done the 5th one [lesson]… I was like ok.. I figured it out. (Mary, personal communication, September 30).

Evaluative Feedback. The participants talked about the different ways that they provide feedback to their students. Susan said: "Yeah, that's why I grade so fast. I have to

evaluate them [the students] immediately… That's like one of my tools." (Susan, personal communication, September 30). Bill responded to Susan's comment by saying:

> When you get feedback are you like gosh why are they missing this? …cause it offends me. I take it personally…and I feel like I failed them. I don't' know, do you feel the same way? (Bill, personal communication, September 30).

Donna discussed how she gives feedback to her students through conversation, notes on their papers, and individual conferencing with them when she returns graded tests or quizzes:

> My first year teaching, I had a student and I knew her morale was not that good… I mean her attitude [about math] was bad…but I could tell she was smart, I mean I could tell she was very smart. She did not even try. …she was failing the first semester. And so one day, I talked to her and I told her I know there is a smart person in that brain and you [the female student] don't want anybody to know. Well, me talking with her each week…it made a difference. That kid made an A on everything I gave her semester. I came in one day after second semester and found the most beautiful letter from her. Saying that no one else knew who I was or cared who I was you and I wanted to do so good for you, I wanted to make a difference to you [Donna], to show you that you were right about me and that just did it for me. I actually connected with her and she performed for me because of that… (Donna, personal communication, September 15).

Perceptions about Their Students

Three of the research participants have been out of the university setting for more than seven years. Even though research on teacher dispositions is documented throughout

the past four decades, the emphasis on dispositions for university education programs began when NCATE (2001) defined professional dispositions as the values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities, and outlined standards on which to assess the dispositions of preservice teachers. During the focus group discussion regarding the participants appeared to realize a connection between their teaching metaphors and their dispositions. Bill asked the researcher to define dispositions. The most recent NCATE (2008) definition of professional dispositions was shared with the group.

> Researcher: I will give you the definition of dispositions that my education program uses:
>
> "Professional dispositions are the professional attitudes, values, and beliefs demonstrated through both verbal and nonverbal behaviors as educators interact with students, families, colleagues, and communities" (NCATE, 2008, pp. 89-90).
>
> Bill: Oh…that makes sense. Of course, I teach math…but it's our jobs as teachers to build relationships with our students. So, that they'll [students] will be interested in the content that we're trying to teach. The content is important, but it is such a small portion of what we [teachers] really do on a daily basis. It is really about talking to the students and relating to them…about how the math works. You have to understand where the students come from…if you don't care then they won't care either.
>
> Researcher: Do you see a connection between your teaching metaphor and your disposition?

> Bill: … maybe it has a little bit to do with my building relationships within the classroom. Well it's about understanding that you can't just plow over things. Sometimes you have to navigate where you're going. So you have to talk to the students and you have to navigate through their behavior. Through their facial expressions, you know, you have to be able to see your way through the right thing to get where you need to go and that's them. (Bill, personal communication, September 15).

After hearing and reading the NCATE (2008) definition, Susan said:

> When the students come back and see you after the whole year has gone by and they say such gracious, nice things…You feel… I feel that I took a class [content] that was very, very difficult and, yet, they [students] felt so comfortable at the end to say that to me.
>
> Researcher: Do you see a connection between your teaching metaphor and your disposition?
>
> Susan: exactly because if your this…Physician or Physicist and you're able to explain something and you know the general public is able to grasp it …later on, someone says "what you said really made a lot of sense"….I feel that's how I model things and that's the way I am in that respect. And I stop along the way and then they [students] will do a few problems, and then I will go back…and then to something new. So I kinda piece meal or chunk it…and that's very important. I know [these things] now that I'm teaching so long. I also know where they [students] struggle right up front and I kinda point that out. "This is where you will struggle. This is where you will make a mistake." [I offer suggestions

> like]…maybe get a different color pen or pencil and make a note of it so you won't do the same thing. So to help them [students] I try chunking it [content] and point out common mistakes. (Susan, personal communication, September 19).

When Donna heard the NCATE (2008) definition, she said:

> Oh, that is what I meant when I talked about not being perfect.
>
> Researcher: Do you see a connection between your teaching metaphor and your disposition?
>
> Donna: I care about my students and their families and I think it shows through when I teach. In college, if you got an answer wrong…it was just wrong. I don't do that [in my classroom]. If they [students] got the concept right and got all the steps right and they made a small little error in adding or subtracting or whatever and if they had not done that the answer would have been right, I don't give them full credit but I surely don't take off for the whole problem. I think that is part of my love. They are my children and my children know I love them no matter what they do. When it comes to teaching that is how I feel, Love. Because I love it, because I want to reach them [students] so they will love it, and love me and love the school, and love what they are doing and love math. (Donna, personal communication, September 15).

Donna commented on this again in the focus group discussion:

> And then there are teachers that are old… like me with less experience, who seriously love to come to work. I get here early every day and I am here late every day. So that's a disposition in itself. It's a good disposition and a bad disposition. I believe we all have them…I think to teach good, we have a disposition towards

> teaching. Wow. I honestly just love coming to this building because I instantly feel good. I am a different person here than I am anywhere else. (Donna, personal communication, September 30).

Mary also commented on how building personal relationships with students is important to her teaching:

> I'm just very compassionate. And, uh, sometimes, I know that they [students] will try to take advantage… I've tried to find that balance, because obviously you need to be strict. You need to have those rules and homework is due and things like that.
>
> Researcher: Do you see a connection between your teaching metaphor and your disposition?
>
> Mary: I don't know. I think, I think they are kind of separate a little bit. I mean, I think I can bring them together.
>
> Researcher: How?
>
> Mary: Like you know you've got the students that flat out hate math and they like come in with that wall up. Right. I'm passionate about the students being passionate about math…So I think in my planning just wanting them to feel that same passion towards it… So I try to think of things that I can add in class that are hands on, so that they will enjoy class more… more enthusiasm. (Mary, personal communication, September 16).

The Relationship Between Mathematics Teachers' Expressed Metaphors and Their Instructional Practices or Models

There is an abundance of research on the subject of teaching metaphors in the area of preservice teachers; although, the literature is lacking with regard to the teaching metaphors of inservice teachers. The review of the literature indicated many researchers' assertions that improving instruction ultimately depends upon research which not only examines teacher practices, but also analyzes teachers' perceptions of their practices (Leavy et al., 2007; Mahlios et al., 2010; Martinez et al., 2001; Noyes, 2006). Furthermore, Patchen and Crawford (2011) contend that truly understanding what happens in the classroom requires reflective analysis on teachers' epistemological orientations, or the beliefs that teachers have regarding the construction of knowledge. Researchers like Martinez et al. (2001) asserted that because a teacher's metaphor for teaching is linked with his or her belief system, teaching metaphors should also be able to help uncover a teacher's basic beliefs about teaching and learning. In a study that compared the teaching metaphors of preservice and inservice teachers, Martinez et al's findings indicated that teachers' teaching metaphors can be categorized in one of three views of teaching and learning. This study's findings were discussed at length in the review of the literature, however, a brief overview of the teaching and learning perspectives are:

1. Behaviorist: Teachers with this orientation share traditional metaphors which depict teaching and learning as a transmission of knowledge; the teacher constructs and delivers instruction, and students are the receivers of information and passive in learning. A teacher with this orientation would most likely structure his or her classroom in a teacher-centered stance, using

strategies such as lecture and/or note-taking, and learning would most likely be vicarious (Bandura, 1986, 1997; Schunk, 2011).

2. Constructivist: Teachers with this orientation typically believe that knowledge is constructed by changing old schemata into new schemata through various experiences, in which the teacher and students are collaborative and active participants in the teaching/learning processes. A classroom structure would likely be student-centered and interactive, and learning would most likely be enactive (Bandura, 1986, 1997; Schunk, 2011).
3. Situated or socio-historic: A key component of this orientation is the belief that knowledge is created and made meaningful by the context, culture, and activities through which it is acquired (Martinez et al., 2001, p. 967-968).

In 2007, Leavy et al. replicated the Martinez et al. research over the course of year-long, methods courses. Leavy et al.'s findings revealed a fourth category that was titled "self-referential" (p. 1224) for metaphors that did not seem to fit any of the three Martinez et al. categories. Leavy et al. (2007) defined self-referential teaching metaphors as those that described the act of teaching, but did not refer to the students, the classroom, and/or classroom resources. The researchers interpreted that the descriptions for the act of teaching metaphors were determined to be "egocentric and focused on what teaching represented for them as individuals, and did not refer to components that we would consider central to the practice of teaching" (p. 1226). Leavy et al. (2007) stated that this study differed from the Martinez et al. (2001) study due to the fact that the participants in that study were a mix of preservice and inservice teachers. Leavy et al. (2007) posited that an explanation for the self-referential metaphors would be that preservice teachers do

not have a broad classroom experience from which to draw perceptions or to enable them to extend the metaphor beyond themselves, as teacher, to the students, to learning, or other subcategories of the teaching experience.

To answer the research question which explores the connection between the teaching metaphors and instructional practice, data from the classroom observations and the researcher's field notes and memos provided the majority of the evidence. As reported earlier, the participants' dispositional stance was measured using the Teaching Disposition Index (TDI). Bill, Donna, and Mary scored higher in the student-centered stance as compared to the teacher-centered stance, and Susan scored higher in the teacher-centered stance as compared to the student-centered stance. Each participant's teaching metaphor can be aligned with a distinct view of teaching and learning.

Bill's metaphor is "Teaching is a River." In an earlier section of this chapter, evidence was presented how Bill indicated the ontological mapping of his teaching metaphor. He viewed his students as contributors to the classroom. In his metaphor, Bill sees himself as the navigator of the boat and his students are the passengers. Bill did not classify himself as the captain, which the researcher found interesting and noted:

> Bill referred to himself as the navigator of the boat and mentioned that he had all of these paths that he could choose to take the students down the river. He also talked about that it did not matter which path he took, because there was only one goal…to get to the ocean. It is interesting to me that he did not say that he was the boat's captain. The captain seems to be more authoritative than just the navigator. Based on how he extended his metaphor, I would classify it as student-centered. He sees himself as the navigator, and the passengers have input on the travel

> down the river. His indication to me that the path did not matter tells me that he is open-minded and willing to try different methods to get the students to understanding. (Researcher memo, September 15)

In the classroom observation of Bill, the researcher wrote:

> The teacher moves all around the room…from the front to do an example, then down the aisles to check student work while he is still teaching away. He has multiple forms of technology at use in this lesson in the forms of an interactive whiteboard, a document camera, and calculators. There are 35 students in the classroom, yet the teacher moves easily in and out of the aisles and there is participation from the students that is consistent, yet not chaotic…" (Researcher's field notes, September 27).

Bill's dispositional stance, his metaphor, and his classroom on the day of the observation were all student-centered.

Susan's teaching metaphor was "teaching is a high level scientist." In a previous section, the researcher presented data evidence that Susan viewed her students as her audience. In this metaphor, the teacher is the giver of information and knowledge and the students are the receivers of the knowledge. This view of teaching and learning aligns with a behaviorist perspective, which is traditionally a more teacher-centered way of teaching. When asked if she would like to elaborate on her metaphor, Susan did not give any indication of how she would extend her metaphor past her students and herself. During the classroom observation, the researcher noted:

> Susan teaches AP statistics, one of the high level subject areas offered in the high school. Her metaphor makes perfect sense given the content that she has mastered

> and teaches to students. Susan starts the lesson at the front of the room and the majority of the time is lecturing and students are using their calculators along with her. After instructing the students on one problem, while they were finishing the problem, the teacher walked around the room with her arms crossed and spoke to the students politely, encouraging them to work on their own to solve the second problem that was on their worksheet. This lesson is teacher-centered…it could be the nature of the AP class, or it could be how Susan has conditioned the students to be self-reliant and self-regulated, or the students are that way by nature. The class is very efficient and the lesson is well-organized. (Researcher's field notes, September 21).

Susan's dispositional stance, metaphor, and her classroom style on the day of the observation were all teacher-centered.

Donna's teaching metaphor was self-reported to be love. Evidence was presented in an earlier section that she saw her students as the recipients of love, and the mathematical content is a gift of love. Donna said:

> Well, if everything is flowing how it should be then the love should be everywhere. All teachers should be giving the love and all instruction should be going that way. And I think all students should be going to a place that they think is safe, that they think they are cared about, where they think what they do matters, and that's all. Doesn't mean it happens that way and it doesn't mean it always happens in my class I'm not good at giving love every day. (Laugh) Sometimes when you give you get a lot back. And when that happens it just makes your day. (Donna, personal communication, September 15).

At first, it was not clear how Donna's metaphor would be classified. Giving love can be one dimensional and Donna could be giving love and just expecting her students to receive it, which would classify it as behaviorist. However, in Donna's metaphor, teaching is love, she spoke of love as a two-way connection when she said "…sometimes when you give [love] you get a lot back…and when that happens it just makes your day." (Donna, personal communication, September 15). The fact that she views teaching in terms of her students participating in the process classifies her metaphor as more student-centered. During the classroom observation, the researcher noted:

> The teacher uses terms of endearment with every student (e.g., "what was your answer, sweetheart," "Let me see your work, sweetie, and we can figure it out," "oh baby, you did not have to do that one"). The lesson is factoring by using Algebra tiles and the teacher spends very little time at the front of the room. It is evident that the students have used Algebra tiles many times and the teacher gets them started in groups and moves around the room to monitor them. As she walks, she pats the students' backs or rubs their arm as she passes by and her physical gestures do not distract any of the students, in fact, the students seem very accustomed to this teacher's signs and words of endearment. (Researcher, field notes, September 21).

After the observation, the researcher noted as a memo:

> In the middle of the lesson, I started counting the different times that she used as term of endearment with the students and had 22 tick marks by the end of the lesson. I think one of the comments that really caught my attention was with about five minutes left, she asked the students to help her pick up her "toys."

> Wow…in the interview, Donna spoke about how she loves the students as if they were her children; however, after watching her teach…she really does treat these students as if they were actually her children. This class is an on-level freshman level math course. I wonder if her teaching style would work with an older group of students? Or an honors level of this content? (Researcher, memo, September 21).

Donna's dispositional stance was student-centered. On the day that her class was observed it was a student-centered lesson and her metaphor was classified as student-centered.

Mary's teaching metaphor was self-reported as "teaching is like an archaeologist." However, Mary admitted that she had been a part of a discussion on teaching metaphors in her master's class.

> Researcher: Think for a moment about your teaching. If you had to define your teaching as a metaphor, what would it be?
>
> Mary: This is actually stunning because, we talked about this in one of my graduate classes. Actually, we were talking about metaphors and teaching and the one…well, we talked about a couple of different ones and Archeologist was the one that kinda stuck out to me.
>
> Researcher: Really?
>
> Mary: …should I actually go into what it was?
>
> Researcher: Absolutely.
>
> Mary: For this metaphor, I think it was really more about the teacher kinda digging things up and finding what works and what didn't, finding what is

> important and wasn't important…kinda documenting those things, like an archeologist would do, discussing and discovering different things that work. (Mary, personal communication, September 16).

Because Mary had participated in a discussion about teaching metaphors with her Master's cohort, she chose the metaphor which she thought best fit her teaching. The other participants in this study expressed metaphors that were authentic, whereas Mary had several choices for metaphors. "…another one was photographer or camera … looking at it [teaching] through different lenses…somebody said garden, or flowers, or something else..." (Mary, personal communication, September 16). Mary did not elaborate on how she would extend her metaphor to the students or other aspects of teaching in either the individual interview or focus group discussion. The researcher could not create an ontological mapping of Mary's metaphor, but did classify the metaphor as self-referential, based on the research by Leavy et al. (2007). Mary had only been teaching for a few weeks at the time of the interview, which could classify her experience level to that of a pre-service teacher, like the participants in the Leavy et al. study. On the day of the observation, Mary was teaching the same lesson that had been observed in Donna's classroom. The researcher noted:

> The teacher is standing at the front of the room and is talking with the students as they work through the lesson on factoring with the Algebra tiles. She walks to a group near the front of the room, and indicates that there is a mistake with the placement of the tiles. The teacher asks the entire class, "Is any other group having problems with number 3?" Several groups indicate that they are. The teacher walks to the front of the room and turns on the overhead projector. She

> has a set of overhead tiles and walks the students through that example. From her seat at the front of the room, she questions the students on the process as she works the problem out on the overhead. Three or four students are answering the questions. In at least three of the groups, the students are copying what the teacher is writing on the overhead. Two groups have stopped working and are talking quietly. Two groups seem to have moved past that problem and are working on the next problem. (Researcher, field notes, September 22).

Even though Mary's score on the TDI was higher in the student-centered stance, as compared to the teacher-centered stance, her class on the day of the observation was conducted in a teacher-centered format. Teacher-centered lessons are more in line with a behaviorist perspective. Mary's metaphor was classified as self-referential based on the fact that she explained it only in terms of what the teacher would do. When sharing her metaphor with the other participants in the focus group discussion, she said:

> You know that's funny because when [the researcher] asked me, we had discussed it [teaching metaphors] in graduate school… and I'm like listing them [the metaphor choices] in my head… which one do I like the best, and mine is Archeologist. Because I feel like as a new teacher I'm constantly trying to like find what works in the classroom and you know and dig up things that I can use for my student's and figuring out what's good, what I need to keep, record and you know like Archeologist do… (Mary, personal communication, September 30).

Mary was the only participant whose metaphor did not align with her dispositional stance as measured by the TDI. The findings regarding Mary and her teaching metaphor will be discussed in detail in the next chapter.

Summary

The purpose of this study was to explore if a relationship exists between the teaching metaphors and the dispositions of inservice-mathematics teachers'. The research study was conducted using a two-phase research design. The first phase of the research utilized quantitative measures to gather demographic information on a convenience sample of high school teachers, as well as to determine these teachers' dispositional stances with respect to student-centered versus teacher-centered selected-response survey items. The second phase was conducted utilizing a qualitative paradigm: case-studies. The participants in phase two were purposefully chosen from the phase one participants in order to represent a broad demographic range. The findings of the case-study emerged as clear and common themes regarding the connection between dispositions and teaching metaphors. Quantitative and qualitative analyses were performed exhaustively in order to gather information regarding if a relationship exists between high school mathematics teachers' teaching metaphors and their teaching dispositions.

The first five research questions were to find out if there were differences dispositionally between certain demographic domains of teachers. Statistical analysis on the quantitative data revealed no significant differences in the areas of gender, content area, or degree earned. However, there was statistical significance in the difference between the age of a teacher and the number of years he or she had been teaching. These results will be discussed more thoroughly in the following chapter.

Question 1: What are the teaching dispositions of inservice teachers at the high school level when considering student-centered versus professional, curriculum-centered stances?

The results from the TDI indicated to the researcher whether inservice teachers scored higher on questions categorized as measuring student-centered stance or teacher-centered stance. Bill, Donna, and Mary scored higher on the student-centered stance as compared to the teacher-centered stance. Susan scored higher on the teacher-centered stance, as compared to the student-centered stance.

Question 2: Are there significant differences in the dispositions of inservice teachers based on gender? If so, what are the differences?

The result of the independent *t*-test revealed a significant difference by gender, with females scoring higher in the student-centered subscale than males. Therefore, the researcher's hypothesis was correct and the reasons supporting this hypothesis will be discussed in the following chapter.

Question 3: Are there significant differences between the dispositions of teachers based on years of experience? If so, what are the differences?

Statistical results indicated no significant differences on the subscales when considering years of experience.

Question 4: Are there significant differences between the dispositions of teachers based on their age? If so, what are the differences?

ANOVA results indicated no significant differences on the subscales when considering the age of the teacher. As a result of this, hypothesis 4 was rejected.

Question 5: Are there significant differences between the differences of mathematics teachers and other content areas? If so, what are the differences?

The result from an *ANOVA* test shows that there were no statistically significant differences in the dispositional stances based on content area. As a result of this finding, Hypothesis 5 was rejected.

Qualitative Research Questions

Question 6: What are mathematics teachers' metaphors of teaching, and what is the connection between their metaphors and dispositions?

The purpose of the first part of question six was to establish the teaching metaphors of the four participants. Each of the participants self-reported metaphors are detailed in table 4.4.

Table 4.4. Summary of participants' self-reported metaphors

Participant	Teaching Metaphor
Bill	A river
Susan	A high level scientist
Donna	The act of Love
Mary	Archaeologist

The second part of question six was to determine if there were connections between the participants' teaching metaphor and their dispositions. The data analysis revealed the participants' perceptions of a connection linked to their belief systems in three areas: (1) prior experiences which led them to teaching; (2) their self-reported dispositions of teaching; and (3) connections to their students. The three areas are, in part, the basis of a

teacher's belief system, which, according to educational research will impact both the teaching metaphor and the teaching dispositions.

Question 6.1: What are the differences in mathematics teachers' metaphors and dispositions when considering differing demographics of gender, age, years of experience, and/or highest earned degree?

The purpose of question 6.1 was to explore teaching metaphors and dispositions based on different demographics of inservice teachers. The majority of research in the area of teaching metaphors has been in the area of preservice teachers. In this study, the findings indicate that the connection between the teaching metaphor and the teaching dispositions was found in the belief system of three of the participants. The participant who did not seem to show a connection between the teaching metaphor and dispositions was Mary. She had been teaching less than a month when she participated in this study, which is very close to still being considered a preservice teacher. These findings will be discussed in detail in the next chapter.

Question 6.2: What is the relationship between mathematics teachers' expressed metaphors and their instructional practices or models?

The purpose of question6.2 was to explore the impact that teaching metaphors have on teachers instructional practices. The findings revealed that participants' dispositional stance (as measured by the TDI in phase one aligned with the type of metaphor that they self-reported in phase two. Studies by Martinez et al. (2001) and Leavy et al. (2007) reported that teacher metaphors align with one of three views on teaching and learning: (1) behaviorist; (2) constructivist; and (3) situated. Leavy et al. (2007), working only with preservice teachers, added a fourth domain defined as self-referential. The researcher

used the Martinez et al. (2001) and the Leavy et al. (2007) research studies as a guide to categorize the participants' metaphors based on what they self-reported in either the individual interviews or the focus group discussions, which were completed prior to the classroom observations. Data collected from the results of the TDI, the classroom observations, and the focus group discussions confirmed that the instructional practices on the day of the observation aligned with the classification of their teaching metaphor for three of the four participants. These findings will be discussed in detail in the next chapter.

The next chapter of this dissertation research will outline a detailed discussion of the findings presented in this chapter. The discussion will be framed in the context of the theoretical framework and the review of the literature. The chapter will conclude with the implications of this study, a discussion of the limitations of this study, and the suggestions for future research.

CHAPTER 5

DISCUSSIONS, CONCLUSIONS, AND IMPLICATIONS

Introduction

The purpose of this research study was to explore relationships between mathematics teachers' teaching metaphors and their teaching dispositions. Although the majority of the research both in teaching metaphors and professional dispositions has been strengthened by studies regarding preservice teachers (Bullough, 2010; Katz & Law, 2010; Leavy et al., 2007; Mahlios et al., 2010; Martinez et al., 2001; Noyes, 2006; Patchen & Crawford, 2011; Saban et al., 2007; Yob, 2003), this study focused on inservice teachers in an effort to inform an understudied population, specifically high school mathematics teachers.

In chapter four, the findings and results of the study based on the data analyses were discussed in detail. In this chapter, an overview of the study will be followed by a discussion of the themes, which are grounded in the findings of this study and the review of the literature. The discussion of the results will be presented in two sections and will follow the order of the research questions. The findings for the first five research questions were based on quantitative measures and will be discussed in the first section. The next section will provide a detailed discussion on the findings of questions 6-6.2, which were based on both quantitative and qualitative data. Finally, the chapter concludes with a discussion of the significance and limitations of this study, the implications for practice and future research, and the researcher's conclusions.

Overview of Study

Interest in metaphor research as a way to better understand teachers' conceptualization of all aspects of teaching: instructional preparation, schooling, students, and curriculum has increased in the past few decades (Martinez et al., 2001; Saban et al., 2007). Metaphors as defined by Mahilios et al. (2010) are "analogic devices that lie beneath the surface of a person's awareness and serve as a means for framing and defining experiences" (p. 49). Human beings use words, images, symbols, gestures, etc., to interact with and to interpret experiences, including life, work, and their sense of being (Lakoff & Johnson, 1980).

Subsequently, it is logical that teachers' metaphors for teaching would also be used to interpret perceptions and beliefs held about teaching. Current literature indicates that researchers have explored metaphors and how they explain teachers' attitudes and beliefs (Bullough, 1991; Leavy et al., 2007; Martinez et al., 2001; Parks, 2010). Teachers use metaphors to define their view of teaching and extend these metaphors to further define their classroom practices, themselves, their students, their curriculum, and their perceptions of the teaching profession in general. Because the majority of the research focused on preservice teachers, this study was designed to focus on inservice mathematics teachers and, as a result, has filled a gap in the literature. The information on inservice teachers is important due to the shift in educational policy to putting accountability measures in place to ensure effective teaching which the literature outlines is necessary for student achievement. Teacher education programs are using metaphor and dispositional research to challenge and to guide the belief systems of preservice teachers as discussed in chapter two. Because teacher education values this research as a

way to develop more effective teachers, inservice teachers might also value this research as a way to improve their own instruction.

Bandura's Social Cognitive Theory is one of the theoretical frameworks used in this study. In this theory, human behavior is explained within a triadic reciprocality model in which human behavior is a result of the interactions amongst personal, environmental, and behavioral influences (Bandura, 1986). Social cognitive theory extends to collective agencies, which would include mathematics teachers. Additionally, Lakoff and Johnson's (1980) Conceptual Metaphor Theory was used to provide a complementary theoretical support for this study. CMT frames how a teacher's practices, dispositions, and even belief system are influenced by their teaching metaphor. Together, these theories were merged to provide the framework of this study.

The purpose of this study was to explore the relationship between a teacher's metaphor for teaching and his or her dispositions. Specifically, it focused on inservice mathematics teachers; therefore, the four participants in this study were purposefully selected from 52 initial respondents to an electronic survey used to gather demographic and dispositional data. The maximum variation sampling was selected by the researcher to best represent a wide demographic distribution. The research was conducted in a two phase design, utilizing quantitative and qualitative measures. Evidence for the findings is provided by data that were collected through an electronic survey, individual interviews, classroom observations, a focus group discussion, participant member-checking, and the researcher's memos and field notes. All interviews were transcribed electronically, and the data were stored either in one notebook and/or an electronically created case-study database. The case-study data base was kept secure at all times by the researcher. The

data analysis process was done primarily through spreadsheets and matrices created by the researcher, and all data were analyzed using open, axial, and selective coding, and interpretation was based on existing research in the areas of dispositions and teaching metaphors.

Discussion

Review of Phase One Findings

The first five research questions were designed to gather demographic data from inservice teachers and to determine if there were significant differences in their dispositional stance in four domains: (1) gender; (2) years of experience; (3) age of teacher; (4) and content area. The Teacher's Dispositional Index (TDI) was employed to gather data on the dispositional stance of the inservice, high school teachers. The TDI has two subscales: student-centered and teacher-centered. The first question was answered once the survey was completed and tabulated. For question 2, an independent *t*-test revealed that there were significant differences found in gender on the student-centered subscale, females scoring higher than males. Therefore, the researcher's hypothesis was correct and this is supported by the significant difference revealed in the statistical analysis. One possible explanation for this finding may be based on the work by Noddings (2005). She posited that although knowledge of content and pedagogy are important parts of the learning environment, interactions between teachers and students involves much more than just delivering content and when those interactions are constructed in a caring and supportive environment, both teachers and students reap the benefits. Likewise, Gilligan (1982) asserted that the feminist morality of care stresses empathy and develops to a greater degree in females. Agreeing with this premise,

Arnstine (1990) wrote that it seems reasonable that key dispositions such as "caring and kindness" would be inherent to those who seek to become teachers. But she also felt that those same dispositions could be the reason that teachers become frustrated with the profession. If an exceptionally caring individual is overwhelmed to the point of not having the time to exhibit caring to his or her students, then frustration followed by guilt is often the result. Donna and Bill both described themselves as compassionate, and Donna further stated that she becomes frustrated because there are so many students that do not seem to "care" about learning as much as she does about teaching them.

The *ANOVA* results for questions 3, 4, and 5 did not indicate significant differences between any other demographical domains. There are many reasons that may explain why no significant differences were found. This study was limited by the number of participants surveyed. Due to district restrictions, the researcher was only allowed to distribute the electronic survey to one high school. This limited the number of participants needed to generate a sampling that was large enough to generate a sufficient amount of data. The researcher decided to disseminate the survey using Google documents; however, using another survey method such as Survey Monkey might have generated more teachers willing to participate given that this method is commonly employed in this district and teachers may have been more familiar with it. The timing of the quantitative data collection could have also limited the ability to generate a large enough sampling. The electronic survey was distributed approximately one month prior to the end of the year. Teachers are typically busy during this time of year, and this busy-ness may have contributed and/or prohibited more teachers from participating in the study.

Because participation in the study was voluntary, those who self-selected to complete the survey may be more similar to each other, especially coming from the same school culture. This may be an additional reason for the lack of significance by content area, years of teaching, and age. Finally, gender may simply be a more salient characteristic when examining teacher dispositions.

Review of Phase Two Findings

Question 6 investigated the teaching metaphors of four mathematics teachers and the connection of their respective metaphors to their individual dispositions. The study of how humans use metaphors as a way to make sense of many aspects of their lives began in the field of psychology with the research of Lakoff and Johnson (1980). This research opened the door for other fields, such as education, to explore how metaphors, either consciously or subconsciously, could shape perceptions, belief systems, and behaviors of teachers (Bullough, 1991, 2010; Hong-mei, 2010; Leavy et al., 2007; Martinez et al., 2001; Patchen & Crawford, 2011). Likewise, mathematics teachers use metaphors to help their students better understand and make sense of the mathematical concepts (Font & Bolite, 2010; Noyes, 2006; Parks, 2010). More specifically, there is significant research on the types of metaphors that are used to teach mathematics (Bullough, 2010; Chapman, 1997; Lakoff & Nunez, 2000; Noyes, 2006). Noyes (2006) posited that although the number of metaphorical phrases that mathematics teachers use in their classroom is extensive, the majority fall into three general categories: (1) grounding metaphors; (2) linking metaphors; and (3) extraneous. Researchers in mathematics education have begun to explore how metaphors could also be used to help mathematics teachers make sense of their teaching (Bullough, 2010; Chapman, 1997; Noyes, 2006). In the present study, the

teaching metaphors of the participants were self-reported through individual interviews and a focus group discussion. Three of the four participants reported that they had no previous knowledge of teaching metaphors. One of the participants was enrolled in a Master's of Arts in Teaching (MAT) program and had discussed metaphors for teaching with her class the week before the interview.

All four participants indicated that they have a metaphor of teaching, and three of the four participants extended the metaphor to define other aspects of their teaching as well. Bill's metaphor was that teaching is a river. He discussed not only how a river defined his teaching, but that he was the navigator. Bill discussed, in detail, the extension of the metaphor which included describing his students as the passengers, his teaching goal of mathematical knowledge as the ocean, and the barriers of teaching as rocks. Susan explained that her metaphor would be a scientist who has to explain high-level content to an audience in a way in which the members of the audience would understand. In Susan's metaphor, she is the scientist and her students are the audience. Donna indicated that her metaphor for teaching is the act of love and she extended her metaphor by comparing teaching mathematical content to the giving of love and her students as the recipients of the love. Lastly, Mary chose the metaphor, teacher is archaeologist. She did not extend her metaphor beyond the teacher. Table 5.1 summarizes the participants' teaching metaphors and the ontological mapping and classification of the metaphors.

Table 5.1. A summary of the classifications of the participants' metaphors for teaching

Participant	Metaphor for Teaching	Ontological Mappings	Depiction of Teaching/Learning
Bill	A River	Teacher = Boat navigator Student = Boat passenger Mathematical Knowledge = Ocean Barriers = Obstacles (rocks, topography, etc.)	Student-centered
Susan	High-level scientist in front of an audience of non-scientists	Teacher = High-level Scientist Students = Audience	Teacher-centered
Donna	Love	Teacher = Giver of Love Student = Receiver of Love Mathematical Knowledge = Gifts of Love	Student-centered
Mary	Archaeologist	Teacher = Archaeologist	Self-Referential

Research supported that teachers' belief systems will impact their teaching practice (Arnstine, 1990; Furinghetti, 2007; Ryan & Deci, 2000). Recognition that a teacher's belief system will be reflected in his or her dispositions is validated in the fact

that NCATE (2008) holds universities accountable for assessing dispositions of preservice teachers in its first standard and in the emphasis of professional dispositions by national organizations which assess classroom teachers at different phases of their teaching careers (INTASC, 1992; NBPTS, 2008). Although the definition of teacher beliefs is broad, educational research supports that teachers' classroom practices are a product of their beliefs (Bullough, 1991; Cooney, 1999). After the participants' teaching metaphors were self-reported, the participants were asked if they perceived a link between their teaching metaphor and their dispositions. From their responses, three themes under the umbrella of belief systems emerged: (1) personal experience led them to teaching; (2) perceptions about personal factors (dispositions) impact their teaching, and (3) perceptions about their students shape their teaching.

The first theme that emerged, personal experience led them to teaching, is an important link between a teacher's metaphor for teaching and his or her teaching dispositions. Because metaphors are often used to help make sense of human experiences (Bullough, 1991), personal experiences from the past play a role in what metaphor makes sense for each individual. Likewise, research in the area of education indicates that preservice teachers enter the university with pre-existing dispositions that are based on previous experiences, including interactions that occurred when they were students (Beswick, 2007; Levin & He, 2008; Su, 1992; Wenzlaff, 1998). Determining a teaching metaphor requires reflection on all aspects of teaching including what events may have led to choosing teaching as a profession (Bullough, 1991; Patchen & Crawford, 2011); therefore, each participant was asked to share what events had led to him or her choosing teaching as a career. Each participant had a different story regarding how he or she had

decided to become a teacher, and each of them described how events in their past led them into a teaching career. For example, Bill shared that, upon entering college, he had absolutely no intention of majoring in teaching; however, he described how, as an economics major, he started a club based on the premise of teaching other students about free enterprises. He further reflected that many of the jobs that he had held prior to becoming a certified teacher had some aspect of teaching as a part of the duties and responsibilities of his job. Bill went on to discuss how his initial disdain for becoming a teacher stemmed from his experiences as a student. He even commented at one point that his metaphor, teaching is a river, makes perfect sense given that a river can take many different paths, but will eventually end up at the ocean. Bill viewed his jobs prior to becoming a teacher as the paths that had ultimately led him to teaching.

Similarly, Susan, at first, did not want to become a teacher. She expressed that her roommate in college was studying to become a history teacher, and she remembers thinking that she would never want to be a teacher. Susan finished her degree in chemical engineering and was hired right out of college to work in a chemical plant. Susan shared that many aspects of her first job made her miserable, but she enjoyed leading the school tours through the plant. She described how much she looked forward to interacting with the high school students, and that eventually, she began tutoring students in math. Within a few years, she returned to college to get her Master's degree in mathematics education.

On the other hand, Donna knew early on that she wanted a career in teaching; unfortunately, family circumstances prevented her from completing the degree at that time. When circumstances afforded her the opportunity to return to school, she pursued what she always knew would be her profession, a mathematics teacher. Donna did not

start teaching until she was 50-years old. She discussed how when she was able to re-enroll in the university to become a certified math teacher that the content was very difficult for her. Donna said that she often became very frustrated when her professors did not give any credit when she made a "careless error" that caused her to miss the answer to a test item. Donna discussed how she worked very hard to learn the content and, how becoming a teacher herself, reminds her how important it is for students to gain confidence in their ability to do mathematics.

Mary loved mathematics in high school and had been working with children of all ages in a coaching capacity since she was fourteen. After completing her degree in mathematics and having difficulty finding a job in a mathematics related field, Mary had the opportunity to substitute teach at the high school level. Realizing that teaching mathematics combined her love of mathematics with her love of children, she took the necessary steps to acquire a provisional teaching certificate and was hired as a mathematics teacher. Social cognitive theorists would explain that all four participants decisions to become teachers, whether they had the inclination to do so or not, was due to the fact that each individual's personal experience interacts with his or her environment to influence his or her way of thinking (Bandura, 1986, 1997; Schunk, 2011). Lakoff and Johnson (1980) theorized that conceptually, metaphors incorporate internal beliefs and values, helping individuals to better understand life experiences.

A second theme that emerged, personal factors that impacted their teaching, indicated that each of the participants had distinct perceptions about personal factors that most impacted their teaching. In particular, each one discussed his or her emphasis on: (1) effective teaching strategies; (2) planning and preparation; (3) reflective teaching; and

(4) evaluating feedback. Over the past two decades, the research on dispositions has emphasized that appropriate teaching dispositions will impact classroom decision making, both instructionally and pedagogically, as well as increase student opportunities for learning (Brookhart & Freeman, 1992; Levin & He, 2008; Su, 1992; Wayda & Lund, 2005). The three areas that the participants discussed as personal factors which most impacted their teaching can be categorized as teaching dispositions and a key to instructional efficacy. Darling-Hammond and Sykes (2003) described how effective teachers combine personal traits, behaviors, understandings, and skills with instructional efficacy to create a high-functioning learning environment that fully supports student achievement. In the framework of SCT, Schunk (2011) defined instructional efficacy as a teacher's perception in his or her ability to help students learn.

The first of the four personal factors or subthemes is effective teaching strategies. Bill discussed how he uses effective questioning strategies to engage his students. More specifically, the researcher observed him encouraging thoughtful discussions and his assessment of his students' understanding by using inquiry based methodologies. Susan demonstrated her use of technology as an effective teaching strategy by teaching her students to think analytically while using the calculator to manage the necessary statistical processes. Donna expressed how her experiences in learning mathematics as a 50-year old student caused her to become a very student-centered teacher. Unlike her professors, in an effort to be fair to her students, she uses the practice of giving partial credit if the student shows that he or she understands the content, even if the student does not get the answer 100% correct. Another way that Donna demonstrated fairness in her classroom is through her use of flexible grouping which exhibits fairness in

differentiation for her students, both being effective teaching strategies. In the focus group discussion, Bill, Susan, and Donna all emphasized the importance of effective teaching strategies. Mary discussed the importance of effective teaching strategies in general, but only in the context of what was mentioned by the veteran teachers. She added no specific effective teaching strategies, and in her classroom, she primarily used teacher-centered practices.

The second of the four personal factors subthemes is planning and preparation. During the interview and focus group discussion, each participant discussed how preparation and planning impact the teaching and learning process, although each participant approached planning differently. Bill discussed how he is a "big picture" planner and that he does not necessarily need to plan every detail of his lessons from day to day. He stated that he typically comes in with a general plan of what he will cover; however, he prefers to allow the students the leeway to lead the lesson down a different path [a reference to his metaphor of teaching is a river] because he feels that discovery is a very important part of his effectiveness. Susan, on the other hand, indicated that she is very organized with her lesson plans. She discussed how she may not plan out every minute of her lesson, but she always has an outline and an idea about how she will pace the lesson. Donna indicated that she prefers to plan collaboratively with other teachers. She considers herself a relatively new teacher and feels it builds her instructional efficacy to plan with teachers with who she respects and has similar teaching styles. Unlike Donna, Bill said that it is very difficult for him to plan collaboratively because he feels that he has found only a few teachers whose teaching philosophy line up well with his. He admitted that he is willing to plan collaboratively, however, when he reported that it

often feels forced and hard for him to fully embrace. Mary shared during the focus group that she writes all of her lesson plans in a planner each week and she stays really close to the plans as she teaches. She shared with the group that she often has to look in the book so that she can be sure that she is covering all aspects of the curriculum, while engaging in best practices. The veteran teachers were very supportive in their comments to her and validated her use of a lesson planner. Donna even suggested that she use sticky notes to add her reflections to what she wrote. Bill agreed and said that in a year, the sticky note will remind her of how she would have made the lesson better, or to remind her of changes that she wanted to make after delivering the lesson.

The third of the four personal factors subthemes is reflective teaching. In 2003, Giovannelli found that university supervisors were likely to assess teacher candidates as being effective when they observed the candidate using reflective practice consistently. Bill discussed that his constant reflections on his teaching are key for him to be most effective. Bill's wife is also a high school teacher and he shared how they often reflect together on instructional strategies and best practices. Susan also shared that she is very reflective, even during her classroom instruction. She reported reading the students faces and being able to discern their understanding of the content. Susan stated that she uses this effective teaching strategy constantly to evaluate and assess not only her students' understanding, but her teaching as well. An individual's cognition plays a crucial part in his or her capacity to encode information (Bandura, 1986, 1997; Pajares, 2002). Donna critiqued herself by admitting that she should be more reflective on her teaching. Mary, who is in her first year of teaching, interpreted Bill and Susan's experiences with using reflective practice to construct meaning about using reflective practice (Schon, 1983).

She listened in the focus group discussion as the veteran teachers shared how their emphasis on reflective practice impacted their instructional efficacy. Mary commented that she needed to reflect during the day as well, but found it difficult to balance with her busy teaching obligations. She said she typically reflects about her teaching at the end of each day, and sometimes wishes that she could rewind back to redeliver a lesson after she has practiced it on later class periods.

The fourth of the personal factor subthemes is evaluative feedback. Bill described in detail how he uses questioning as a part of his daily routine of instruction. Bill believes that by teaching the students to question not only mathematics methods, but their own work, that a deeper understanding is possible. Susan described how she impacted her students by having a quick turn-around in grading her students' assessments. As Susan shared with the group about her grading practices, other participants validated that this is an important practice for all teachers to employ. By grading so quickly, Susan described the advantage to the students of having accurate and appropriate feedback in such a timely fashion. Donna gave her students effective feedback through her conversational discourse that she maintains while teaching. She considers her constant feedback as her main informal summative assessments. Donna discussed how her students value the feedback and that they often bring their friends [students from other teachers' classes] along to her study sessions. Mary did not discuss how she gives feedback to students in the individual interview; however, as the veteran teachers discussed feedback in the focus group, Mary joined the discussion by acknowledging that she would begin incorporating some of the feedback strategies that were discussed in her classroom. She offered her own unique method of evaluative feedback by stating that she writes notes on the

students' assessments as she is grading. Mary admitted that it may take her longer to grade, but that she is certain that the students benefit from her commentary.

The third theme that emerged, perceptions of their students shaping their teaching, revealed that participants' perceptions with regards to their students varied. Each of them expressed different opinions regarding the interactions with their students; however, each one did emphasize the importance of interactions with their students. Research in teaching metaphors emphasized that understanding a teacher's metaphor for teaching also reveals an understanding of how he or she sees himself or herself as a teacher (Bullough, 1991).

Bill used the term "building relationships" a great deal as he expressed his goals for connecting with his students. He indicated that he works daily to create a climate where the students feel safe to share their knowledge. Staying true to his metaphor, he did not want his classroom environment to become a rock, or barrier, to students' safety. Bill explained that he stresses to the students the value in being willing to be wrong. Bill stated that once the students feel that they can "mess up" without feeling embarrassed or "stupid," they will take risks and actually begin to understand the content, rather than just go through the processes. Research supports that the emotional climate of the learning environment has also been proven to be important, as well as interactions between teachers and students that are vital to learning (Cohen & Ball, 1999; Day et al., 2006).

Susan did not discuss connections with her students in the same way that Bill did. As mentioned previously, Susan's metaphor provided insight into how she views the teaching and learning process. The interaction between a high-level scientists and her audience would most likely exist in the format of a question and answer forum. As Susan

elaborated on her metaphor, she indicated that the scientist in her metaphor would be able to break the information down and to communicate it in such a way that the audience would gain understanding of the high level content. Based on the research on teaching metaphors and the assumption that the metaphor accurately depicts Susan's most basic beliefs about teaching and learning, then Susan considers it important to break down the statistics' content in order to communicate it in such a way that her students [the audience] gain understanding.

Donna described herself as a teacher who can be strict and rigorous, yet compassionate. Confident that she has positively impacted her students' learning, she shared several instances in which students had communicated to her, in one way or another, that she had made a difference. Donna's metaphor for teaching was the giving and receiving of love. Donna's perception of how she connects with her students is comparative to a mother's connection with her children (Noddings, 2003).

Mary was the youngest of the participants in this study and had only been teaching for a few weeks at the time of the study. Mary's metaphor was teachers are like archaeologists. She discussed how her teaching metaphor represented the importance of "digging" to find the best strategies for teaching to promote student achievement. Mary reported that one of her goals for teaching is that she will instill a love of mathematics in at least some of her students. Book and Freeman (1986) found that secondary mathematics teachers are more likely to indicate a desire to transfer a love for the subject of mathematics to their students than elementary teachers who teach mathematics. Mary also shared that her love of mathematics really began in high school, and that she hopes that she can be a catalyst for a student to love mathematics the way her mathematics

teachers did for her. Levin and He (2008) determined that novice teachers often view teaching from the lens of having been a student for more than 18 years as Mary did.

In the framework of SCT, all four participants gave evidence of being able to demonstrate teaching behaviors that ultimately create an environment in which individual students are enabled to be successful (a personal factor), which is called triadic reciprocality and is a key concept of reciprocal determinism (Bandura, 1986, 1997; Schunk, 2011). Likewise, according CMT, a teacher's metaphor for teaching can be shaped in the same way, and there is a growing body of literature in teacher education that has provided more understanding of how teachers conceptualize their beliefs regarding teaching, curriculum planning, and interactions with students (Martinez et al., 2001; Saban et al., 2007).

Question 6.1 of this research study explored whether differences in metaphors for teaching and dispositions would be found when differing demographics, such as gender, age of teacher, years of experience, and content area are considered. The demographics of the participants are recorded in table 5.2.

Table 5.2. Summary of participant demographic information

Teacher Pseudonyms	Gender	Age	Yrs of Exp	Degree Earned
Bill	Male	35	7	M.A.T.
Susan	Female	53	23	M.Ed.
Donna	Female	57	7	B.S. Ed.
Mary	Female	23	< 1	BS in Mathematics; Enrolled in M.A.T.

In phase one of this study, the researcher hypothesized that there would be dispositional differences based on the maximum variation demographics listed above, and this question is an extension of research quantitative questions two thru five. In phase one, a significant difference was found when considering gender in the subscale of student-centered stance, and those findings were discussed previously. Statistically, there were no other significant differences found when considering any of the other demographics. When considering the qualitative data, because all of the teaching metaphors were different, a comparison by metaphor is not appropriate. The only difference that could be discussed is the difference between Mary's metaphor and the other three participants. In short, based on their discussions, it is the researcher's view that Bill, Susan, and Donna's metaphors were authentic and unique, while Mary's was neither authentic nor unique.

At the time of the study, Mary had only been teaching for a few weeks. When asked to describe a metaphor that would define her teaching, Mary revealed that she had discussed the topic of teaching metaphors with her graduate class the previous week. Mary stated that she chose the metaphor that she reported because she had heard it from

another graduate student, and it best fit her philosophy of teaching. As a result, the difference in demographics which impacted the participants' metaphors was that of experience.

Question 6.2 explored the relationship between the participants' teaching metaphors and views of teaching and learning, and the connection to their instructional practices and models. In a study on teaching metaphors by Martinez et al. (2001) the teaching metaphors of inservice teachers were compared to those of preservice teachers. The self-reported metaphors from each group were classified as depicting a specific view of teaching and learning: (1) behaviorist; (2) constructivist; or (3) situated learning. The results indicated that the types of metaphor held by the teachers were influenced by their experiences in the classroom. Patchen and Crawford (2011) reported that the majority of teaching metaphors can be classified as either behaviorist orientation (oriented toward teacher outcomes) or constructivist orientation (oriented toward a student outcome). Aligned with the Martinez et al. (2001) and Leavy et al. (2007) studies, Patchen and Crawford (2011) discussed that metaphors that were classified as behaviorist would describe teaching schema in terms of the teacher, and that student roles and relationships were not as evident. On the contrary, metaphors that were classified as constructivist would describe teaching schema with a focus on student work, and student roles and relationships would be evident and obvious.

Bill's teaching metaphor was teaching as a river. Bill described how he was the navigator of the boat and his students were his passengers. He also detailed how the students have input with regards to which path the boat will travel, and that he does not worry about that because he knows that all paths eventually lead to the ocean. In Bill's

metaphor, the ocean equaled mathematical knowledge, his goal in teaching. Following Patchen and Crawford's (2011) guidelines, Bill's metaphor would be classified as student-centered. On the day of the classroom observation, Bill was teaching a new concept. As outlined in chapter four, Bill did not follow a traditional teacher-centered format of introducing new material by using primarily lecture, notes, and examples. Bill's class was interactive. The students were engaged and asking questions. There were several conversations, but the climate of the classroom was controlled. In the limited context of that lesson, the observation did provide evidence that Bill's instructional practice had components of a student-centered view of learning which aligned with his metaphor.

Susan's metaphor was a high-level scientist who is sharing difficult content with an audience in a way that communicates the information in a clear and understandable way. When compared to the Patchen and Crawford (2011) guidelines, Susan's metaphor was classified as teacher-centered. On the day of the observation, aspects of Susan's interactions with the students and instructional choices also aligned with a more teacher-centered classroom. Susan's stance in the classroom tended to be in the front facing her students. This stance aligned with the metaphor that she related to the researcher. The discourse was one-sided with Susan leading the discussion and asking the majority of the questions. The discourse in the classroom that day would also parallel that of a high-level scientist who is addressing his or her audience. The students were engaged in the lesson in that they were writing down notes and there were several students who asked clarification questions. However, student learning was most likely passive. On the day of the observation, Susan's teaching schema resembled a traditional mathematics classroom.

The teacher at the front of the room, writing formulas on the whiteboard, and the students diligently taking notes and asking low level questions, mainly for clarification. Based on her observation, memos, and field notes, the researcher ascertained that this lesson was not a discovery lesson, but one in which the teacher needed to teach a very specific process.

Like Bill, Donna's metaphor was categorized as student-centered. On the day of the observation, aspects of Donna's metaphor were evidenced in her interactions with the students and in her choice of instructional methods. The lesson was very student-centered with Donna using flexible grouping and Algebra tiles to differentiate her instruction. Her constant flow of feedback served her well in assessing which students needed assistance and in which areas of the lesson. The researcher would describe Donna as a "touchy-feely" type of teacher. She maintained physical contact through her hand on a student's shoulder, or by patting a student's shoulders as she walked by him or her. She often kneeled down beside the desk of a student with whom she was assisting, which put her at eye level or lower with the student. Donna's metaphor was that teaching could be described as the act of love, and Donna's interactions with her students paralleled that description consistently.

There is no assumption that Susan, Donna, or Bill would not choose to deliver a student- or teacher-centered lesson, respectively, on a different day, but the researcher found it interesting that many characteristics of these participants' teaching metaphor were reflected in the interactions with students, instructional strategies, and lesson planning on the day of each respective observation.

Mary's metaphor could not be classified using the Martinez et al. (2001) research. Because Mary had been teaching for less than one month, preservice classification seemed more appropriate. Leavy et al. (2007) studied the teaching metaphors of preservice teachers and found that the lack of experience in the classroom may have been a factor in the number of metaphors that could not be classified as any of the three domains in the Martinez et al. (2001) study. Leavy et al. (2007) defined these metaphors as self-referential and explained that these metaphors depicted only the teaching process without considering the students or any other aspect of the process. Self-referential metaphors were ego-centric, only viewing the teaching process from the teacher's perspective. Like Martinez et al. (2001), the Leavy et al. (2001) researchers determined that the lack of teaching classroom experience had influenced the perspective of the preservice teachers to only consider teaching from the vantage point of teacher. Similarly, the metaphor that Mary chose and described as best aligning with her philosophy of education was classified as self-referential. Mary described the teacher as an archaeologist and stated that she liked the metaphor because it depicted the teaching "digging" up what works and what doesn't work in the classroom. The metaphor does not seem to extend beyond the scope of the teacher. Like the Leavy et al. (2001) study suggests, Mary's choice of metaphor was due to her inexperience in the classroom, and hence her egocentric view of the teacher.

These findings were revealed after the teachers' metaphors, the ontological mapping of the metaphors, and the classification by view of teaching and learning were completed, based on the discussions from the individual interviews and the focus group discussions. In phase one of the research, each of the participants completed the TDI and

a dispositional stance was determined by the score calculated on each subscale. Bill, Donna, and Mary scored higher on the student-centered subscale as compared to the teacher-centered. Susan scored higher on the teacher-centered subscale as compared to the student-centered. During phase two, the participants were each asked to give a metaphor that would define his or her teaching. Based on the answers to the interview questions, an ontological mapping was created for each metaphor, and the metaphor was classified by the view of teaching and learning that it best depicted (Lakoff, 1993; Leavy, 2007; Mahlios et al., 2010; Martinez et al., 2001; Noyes, 2006; Pachen & Crawford, 2011). After both phases of the research were completed, the findings of the quantitative data were compared to the findings of the qualitative data to answer question 6.2, and yes, a relationship existed between the participants' metaphors and their instructional practices and models.

Significance of the Study

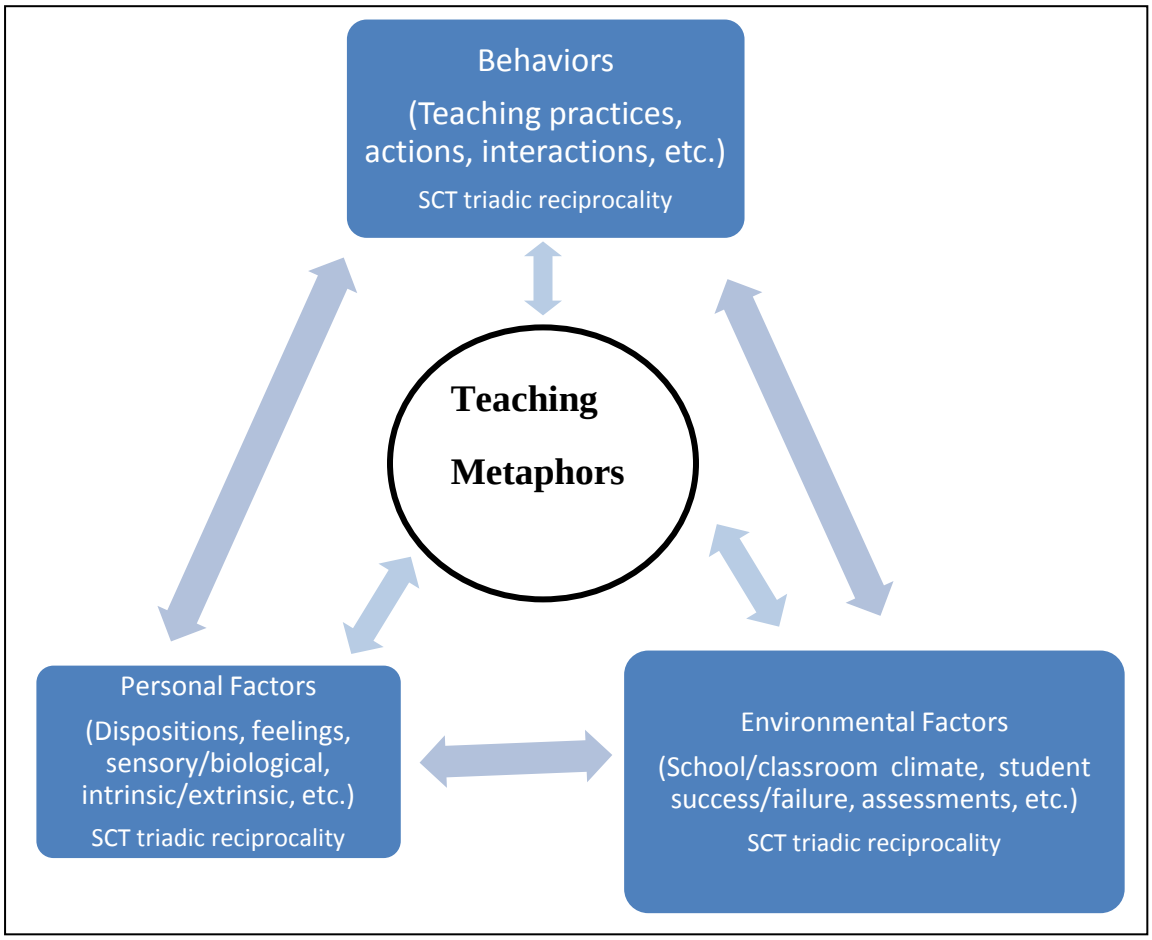
As outlined in the review of the literature, there are numerous studies regarding teaching dispositions and the influence these have on effective teaching, and an abundance of studies regarding the dispositions of mathematics teachers. Likewise, research in the area of teaching metaphors is growing, and there are several studies on the teaching metaphors of mathematics teachers. However, in both areas, the majority of the research is focused on preservice teachers, and no studies were found which explored if there is a link between teaching metaphors and professional dispositions; although, both are linked to a teacher's belief system. The purpose of this study was to explore the relationship between the teaching metaphors and the professional dispositions of secondary mathematics teachers. The significance of this study is that it fills a gap that

exists in the literature with regards to inservice mathematics teachers. Teaching metaphors is a growing field of study and this research study explored a relationship that is understudied: the possible link that exists between professional teaching dispositions and teaching metaphors. The findings from this study showed that there was a relationship between the professional dispositions of the four participants and their metaphors for teaching. Researchers in the field of education need to take a deeper look at not only at teachers' instructional practices, and then to analyze to determine what teachers understand about their instructional practices. This type of research would logically lead to the development of professional learning that would inform inservice teachers on the research in metaphors for teaching.

Referencing the theoretical perspective for the study, Conceptual Metaphor Theory (CMT) provided insight as to how teaching metaphors assist a teacher in making meaning of his or her teaching (Mahlios et al., 2009; Martinez et al., 2001; Saban et al., 2007). Likewise, Lakoff and Johnson (1980) firmly established human thought and knowledge are structured by the teaching metaphors and these are grounded deeply in physical experiences and the contexts in which the teacher is exposed. Coupled with SCT, the processes and factors which shape the teaching metaphors is also circular in nature and grounded deeply in the context of teaching experiences. Figure 5.3 provides a graphical representation of how Social Cognitive Theory, teaching metaphors, and dispositions relate to inform the study. The researcher's findings showed that the environmental contexts of teaching were more influential on the shaping of teachers' metaphor for teaching and this is indicated in the diagram by having the environmental factors box shown slightly larger than the other behaviors and personal factors boxes.

Figure 5.3

The symbiotic relationship of SCT and the formation of the teaching metaphor.



Limitations of the Study

This study has several limitations that should be considered and that could inform future studies related to this one. The design of this study is limited in terms of instrumentation to measure the dispositions of inservice teachers. The TDI was chosen as the assessment tool because it has strong reliability and validity for assessing the dispositions of preservice teachers, and there was no instrument discovered to assess the dispositions of inservice teachers. Another limitation of using the TDI instrument in this

study is that it was only administered once. Typically, assessment tools are administered twice; once at the beginning of a study, and again at the end of a study to measure the impact of teacher education courses to challenge and/or change preservice teachers' dispositions. This study is also limited by the size of the sampling. The district in which the study was conducted had strict guidelines in place for educational research conducted by individuals, and the researcher was limited to a sample of convenience from which to select the mathematics teachers who participated. The small sampling size poses a threat to validity; as well, it limits the statistical power to detect significant differences.

Finally, a limitation of this study is the scope of the study. The number of participants and the time allotted to interview and observe the participants was too short. By studying a larger sampling over a longer amount of time, more significant quantitative and qualitative data could have been collected and the findings would have been strengthened.

Implications for Teacher Practice

Analysis of teacher metaphors has led to conclusions that these can prove valuable in uncovering underlying belief systems that preservice teachers bring to teacher education (Leavy et al., 2007; Patchen & Crawford, 2011). Whether it is to determine or to challenge them, because belief systems play a key role in the effectiveness of teachers, there is value in finding ways to uncover and understand them (McKnight & Douglas, 2004; Thornton, 2006; Wakefield, 1993; Wayda & Lund, 2005). As important as this is for preservice teachers, it is also important for inservice teachers to explore their teaching metaphors given the insight these provide into understanding how a teacher teaches (Leavy et al., 2007; Martinez et al., 2001; Patchen & Crawford, 2010). Patchen and

Crawford (2011) detailed in their study how examining the way that teachers connect their teaching practices with their teaching metaphors will help researchers to understand and to provide support for preservice teachers. By comparing inservice teachers to preservice teachers, Martinez et al. (2001) discovered that the differences between teaching metaphors was linked to lack of teaching experience. This study helps to fill a gap in the area of inservice mathematics teachers. The findings from this study may encourage future researchers to take a deeper look at not only teachers' instructional practices, but also to interpret what teachers understand about their instructional practices. This researcher is interested in creating professional development that would inform inservice teachers on the research in metaphors for teaching. Bullough (2010) posited that there is the potential for professional growth in preservice teachers as they not only develop their teaching metaphors, but are allowed the chance to examine the metaphor deeply to see how it extends to other areas in their teaching schema. It is this researcher's opinion that inservice teachers would also benefit professionally from exploring their own respective teaching metaphors.

Implications for Teacher Preparation Programs

Studies on the teaching metaphors of preservice teachers revealed important findings regarding their pre-existing beliefs, their views on teaching and learning, and how they are able shift their metaphors after coursework in teacher education programs offered metaphors that created dissonance with the initial metaphors (Bullough, 1991; Leavy et al., 2007; Martinez, 2001; Patchen & Crawford, 2011). Furthermore, metaphor construction has value in its ability to assist preservice teachers in understanding their own practice as future educators (Leavy et al., 2007). With the emphasis on standards

based education, it is important for preservice teachers to explore a variety of views of teaching and learning as they develop their own pedagogy and epistemology. Teacher educators should embrace the potential for insight that formulation of metaphors has to enlighten preservice teachers regarding their perspectives not only as future educators, but also in what their metaphor reveals about the lens from past experiences as students themselves.

Recommendations for Future Research

The current study provided a small glimpse into the exploration of the relationship between high school mathematics teachers' teaching metaphors and their respective dispositions. Further empirical research, using a much larger sampling, is needed to bolster validity, reliability, generalizability, credibility, dependability, and transferability, and to provide a deeper understanding of the connections between teaching dispositions and the teachers' metaphor for teaching. There is also considerable potential for further exploration of the relationship between dispositions and metaphors for teaching, as well as how this relationship might be associated with effective teaching in areas such as age, gender, years of teaching, and content areas. It would also be useful to compare the teaching metaphors of different levels of mathematics teachers to determine if differences exist between secondary and elementary mathematics teachers. Likewise, to compare and contrast the teaching metaphors between mathematics teachers to those of other content areas. Metaphoric language has been explored in mathematics education, and perhaps a study which provides comparison of the types of metaphors which are used by mathematics teachers would be of merit in developing professional learning opportunities for inservice math teachers. Although preservice teachers' are likely to be exposed to

research in areas such as teaching metaphors and dispositions during their course of study within teacher education programs; inservice teachers' are more likely only exposed to topics such as these through independent reading or professional learning opportunities.

Conclusions

A teacher's belief system and gender will impact the teaching metaphor, as well as influence his or her teaching dispositions. Three of the participants in this study described authentic and unique teaching metaphors which defined their individual teaching. Two of the participants' teaching metaphors were extended to encompass not only the teaching process, but their students, their goals for teaching, as well as a small glimpse into what their metaphor revealed about their perceptions of teaching and learning. When asked to give their perceptions of how their metaphor connected with their teaching dispositions, the inservice teachers described three areas: (1) personal experience that led them to become a teacher; (2) perceptions about themselves as teacher; and (3) perceptions about their students. Each of these areas could be considered small parts of a much broader definitions of what makes up a teacher's belief system. Educational research supports that a teacher's belief system is a part of the formula for effective teaching (Stodolsky & Grossman, 2000), and furthermore, Philipp (2007) posited that a mathematics teachers' belief about mathematics will impact how they teach mathematics. Although this study did not set out to explore belief systems, there are findings to support that what a teacher believes about teaching and learning could potentially be reflected in the metaphor he or she chooses.

REFERENCES

Albee, J. J., & Piveral, J. A. (2003). Management process for defining and monitoring teacher dispositions. *The International Journal of Educational Management, 17*(7), 346-356.

Alger, C. L. (2008) Secondary teachers' conceptual metaphors of teaching and learning. *Teaching and Teacher Education, 25*, 743-751.

Arnstine, B. (1990). Rational and caring teachers: Reconstructing teacher preparation. *Teacher College Record, 92*(2), 230-47.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*, Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: W.H. Freeman and Company.

Beswick, K. (2007). Teachers' beliefs that matter in secondary mathematics classrooms. *Educational Studies in Mathematics, 65*(1), 95-120.

Boers, D. (2007). *History of American education.* New York, NY: Peter Lang Publishing.

Bogdan, R.C., & Biklen, S. K. (2007). *Qualitative research for education: An Introduction to theories and methods.* Boston, MA: Pearson Education, Inc.

Book, C. L., & Freeman, D. J. (1986). Characteristics of elementary and secondary teacher candidates. *Journal of Teacher Education, 37*(1), 47-51.

Brookhart, S., & Freeman, D. (1992). Characteristics of entering teacher candidates. *Review of Educational Research, 62*(1), 37-60.

Bourdieu, P. (1977). *Outline of a theory of practice.* Cambridge, UK: Cambridge University Press.

Bullough, R. V., Jr. (1991). Exploring personal teaching metaphors in preservice teacher education. *Journal of Teacher Education, 42*(1), 43-51.

Bullough, R. V., Jr. (2010). Parables, storytelling, and teacher education. *Journal of Teacher Education. 61*(1-2), 153-160.

Burant, T., Chubback, S., & Whipp, J. (2007). Reclaiming the moral in the dispositions debate. *Journal of Teacher Education, 58*(5), 397-411.

Burn, K., Mutton, T., & Hagger, H. (2010). Strengthening and sustaining professional learning in the second year of teaching. *Oxford Review Of Education, 36*(6), 639-659.

Butler, A. (2001). Preservice music teachers'conceptions of teaching effectiveness, microteaching experiences, and teaching performance. *Journal of Research in Music Education, 49*(3), 258-269.

Chapman, O. (1997). Metaphors in the teaching of mathematical problem solving. *Educational Studies In Mathematics, 32*(3), 201-228.

Cohen, D.K., & Ball, D. L. (1999). Instruction, capacity, and improvement. *Consortium for Policy Research in Education, Philadelphia, PA:* University of Pennsylvania, Graduate School of Education.

Coke, P. K. (2005). Practicing what we preach: An argument for cooperative learning opportunities for elementary and secondary educators. *Education, 126*(2), 392-398.

Collinson, V. (1996). *Becoming an exemplary teacher: Integrating professional,interpersonal, and intrapersonal knowledge*. (ERIC Document Reproduction Service No. ED 401 227).

Collopy, R. (2003). Curriculum materials as a professional development tool: How a mathematics textbook affected two teachers' learning. *Elementary School Journal, 103*(3), 287-311.

Combs, A. (1972). Some basic concepts of teacher education. *The Journal of Teacher Education, 13*(3), 286-290.

Connelly, F. M., Clandinin, J. D., & He, M. F. (1997). Teachers' personal practical knowledge on the professional knowledge landscape. *Teaching and Teacher Education, 13*(7), 665-674.

Cooney, T. J. (1999). Conceptualizing teachers' ways of knowing. *Educational Studies In Mathematics, 38*(1-3), 163-187.

Creswell, J. (2007). *Qualitative inquiry & research design: Choosing among five approaches.* Thousand Oaks, CA: Sage Publication, Inc.

Creswell, J. (2009). *Research designs: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications Inc.

Crick, R. D. (2007). Learning how to learn: The dynamic assessment of learning power. *The Curriculum Journal, 18*(2), 135-153.

Cuban, L. (1993) *How teachers taught.* New York, NY: Teachers College Press.

Dancer, G. A., Kior de Alva, J. J., Krieger, L. S., Wilson, L. E., & Woloch, N. (2006). *The Americans: A Georgia view*. Evanston, IL: McDougall Littell.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education, 57*(3), 300-314.

Darling-Hammond, L., Chung, R., & Frelow, F. (2002). Variation in teacher preparation: How well do different pathways prepare teachers to teach? *Journal of Teacher Education, 53*(4), 286-302.

Darling-Hammond, L., & Sykes, G. (2003). Wanted: A national teacher supply policy for education: The right way to meet the "Highly Qualified Teacher" challenge. *Education Policy Analysis Archives, 11*(33) 1-55. Retrieved August 6, 2008, from http://epaa.asu.edu/

Day, C., Kington, A., Stobart, G., & Sammons, P. (2006). The personal and professional selves of teachers: Stable and unstable identities. *British Educational Research Journal, 32*(4), 601-616.

Deignan, A. (2005). *Metaphor and corpus linguistics.* Philadelphia, PA: John Benjamins Publishing Co.

Drame, E., & Pugach, M. (2010) A HOUSSE (high, objective, uniform state standard of evaluation) built on quicksand? Exploring the teacher quality conundrum for secondary special education teachers. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 33*(1), 55-69.

Eberly, J. L., Rand, M. K., & O'Connor, T. (2007). Analyzing teachers' dispositions towards diversity: Using adult development theory. *Multicultural Education, 14*(4), 31-36.

Elbaz, F. (1981). The teacher's practical knowledge: Report of a case-study. *Curriculum Inquiry. 11*(1), 43-71.

Elmore, R. F. (2000). *Building a new structure for school leadership*, Washington, DC: The Albert Shanker Institute.

Evans, V., & Pourcel, S. (2009). *New directions in cognitive linguistics.* Philadelphia, PA: John Benjamins Publishing Co.

Fernández, E. (2008). Sex-related euphemism and dysphemism: An analysis in terms of conceptual metaphor theory. *Atlantis (0210-6124), 30*(2), 95-110.

Font, V., & Bolite, J. (2010). Metaphors in mathematics classrooms: analyzing the dynamic process of teaching and learning of graph functions. *Educational Studies in Mathematic, 75(2),* 131-152.

Furinghetti, F. (2007). Teacher education through the history of mathematics. *Educational Studies in Mathematics, 66*(2), 131-143.

Geary, J. (2011). *I as another: The secret life of metaphor and how it shapes the way we see the world*. New York, NY: HarperCollins Publishers.

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development.* Cambridge, MA: Harvard University Press.

Giovannelli, M. (2003). Relationship between reflective dispositions toward teaching and effective teaching. *Journal of Educational Research, 96*(5), 293–309.

Grbich, C. (2007). *Qualitative data analysis: An introduction.* Thousand Oaks, CA: Sage Publications, Inc.

Harris, A., & Muijs D. (2002). Teacher leadership: A review of the research. *National College for School Leadership, 16*(2), 39-47.

Helm, C. (2006). The assessment of teacher dispositions. *Clearing House*, *79*(6), 237-239.

Helm, C. (2006). Teacher dispositions as predictors of good teaching. *Clearing House*, *79*(3), 117-118.

Hong-mei, S. (2010). The cognitive study of metaphor and its application in English language teaching. *Canadian Social Science. 6*(4), 175-179.

Humphreys, M., & Hyland, T. (2002). Theory, practice and performance in teaching: professionalism, intuition, and jazz. *Educational Studies, 28*(1), 5-15.

Ingersoll, R. (2003). *Who controls teachers' work?* Cambridge, MA: Harvard University Press.

Interstate New Teacher Assessment and Support Consortium. (1992, 2010). *Model standards for beginning teacher licensing, assessment and development: A resource for state dialogue.* Washington, DC: INTASC.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Jones, S. R., & McEwen, M.K. (2004). A conceptual model of multiple dimensions of identity. *Journal of College Student, 41*(4), 405-414.

Katz, A., & Law, A. (2010). Experimental support for conceptual metaphors with an episodic memory task. *Metaphor & Symbol*, *25*(4), 263-270.

.Katz, L. G., & Raths, J. D. (1985). Dispositions as goals for teacher education. *Teaching and Teacher Education*, *1*(4), 301-307. Retrieved from EBSCOhost on April 17, 2009.

Kern, D. (2006). *Praxis II: Principles of learning and teaching*. Hoboken, NJ: Wiley Publishing, Inc.

Kimball, M. M. (1994). The worlds we live in: Gender similarities and differences. *Canadian Psychology, 35*(4), 388-404.

Kinsella, K., Feldman, K., Stump, C., Carroll, J., & Wilson, E. (2004). *Literature: Timeless voices, timeless themes.* Upper Saddle River, NJ: Pearson Prentice Hall.

Kohlberg, L. (1981). *Essays on moral development, Vol 1: The philosophy of moral development,* San Francisco, CA: Harper & Row.

Lakoff, G. (1993, 1998). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought,* (2nd ed.)(pp. 202- 251). New York, NY: Cambridge University Press.

Lakoff, G. & Johnson, M. (1980). *Metaphors we live by.* Chicago, IL: University of Chicago Press.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought.* New York, NY: Basic Books.

Lakoff, G., & Nunez, R. E., (2000). *Where mathematics comes from: How the embodied mind brings mathematics into being.* New York, NY: Basic Books.

Lakoff, G., & Nunez, R. E. (2005). The cognitive foundations of mathematics: The role of conceptual metaphor. In J. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 1-37). New York, NY: Psychology Press.

Leatham, K. R. (2007). Pre-service secondary mathematics teachers' beliefs about the nature of technology in the classroom. *Canadian Journal of Science, Mathematics & Technology Education, 7*(2/3), 247-271.

Leavy, A. M., McSorley, F. A., & Bote, L. A. (2007). An examination of what metaphor reveals about the evolution of preservice teachers' beliefs about teaching and learning. *Teaching and Teacher Education, 23*(2), 1217-1233.

Levin, B., & He, Y. (2008). Investigating the content and sources of teacher candidates' personal practical theories (PPTs). *Journal of Teacher Education, 59*(1), 55-68.

Mahlios, M., Massengill-Shaw, D., & Barry, A. (2010). Making sense of teaching through metaphors: A review across three studies. *Teachers and Teaching: Theory and Practice, 16*(1), 49-71.

Martinez, M. A., Sauleda, N., & Huber, G. L. (2001). Metaphors as blueprints of thinking about teaching and learning. *Teaching and Teacher Education, 17*, 965-977.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

McKnight, D., & Douglas, L. (2004). An inquiry of NCATE's move into virtue ethics by way of dispositions: Is this what Aristotle meant? *Educational Studies, 35*(3), 212-230.

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco, CA: Jossey-Bass.

Merriam, S. B. (2002). *Qualitative research in practice: Examples for discussion and analysis.* San Francisco, CA: Jossey-Bass.

Mertens, D. M. (2010). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods.* Thousand Oaks, CA: Sage Publications, Inc.

Miller, J. B. (1976). *Toward a new psychology of women*. Boston, MA: Beacon Press.

Mostert, M. P. (1992). Personal teaching: Puzzles, images, and stories for professional reform. *Preventing School Failure, 36*(4), 16-19.

National Council for Accreditation of Teacher Education. (2001, 2008). *Professional standards for the accreditation of teacher preparation institutions.* Washington, DC: NCATE.

National Board for Professional Teaching Standards (2008). *Five core principles for teachers.* Retrieved on April 25, 2009 from http://www.nbpts.org/the_standards/the_five_core_propositio

NCLB Draft a Boost for Ed Tech. (2007). *THE Journal*, Retrieved July 7, 2009, from Academic Search Complete database.

Noddings, N. (2002). *Starting at home: Caring and social policy.* Berkeley and Los Angeles, CA: University of California Press.

Noddings, N. (2003). *Caring: A feminine approach to ethics and moral education* (2nd ed.). Berkeley and Los Angeles, CA: University of California Press.

Noyes, A. (2006). Using metaphor in mathematics teacher preparation. *Teaching and Teacher Education*, *22*(7), 898-909.

Nunez, R. (2008). Conceptual metaphor, human cognition, and the nature of mathematics. In R. W. Gibbs, Jr. (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 339-362). Cambridge, UK: Cambridge University Press.

Nunez, R., & Lakoff, G. (2005). The cognitive foundations of mathematics: The role of conceptual metaphor. In J. Campbell (Ed.), *Handbook of mathematical cognition* (pp. 109-124). New York: Psychology Press.

Patchen, T. & Crawford, T. (2011). From gardeners to tour guides: The epistemological struggle revealed in teacher-generated metaphors of teaching. *Journal of Teacher Education, 62*(3), 286-298.

Philipp, R. (2007). Mathematics teachers' beliefs and affect. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 257-315). Charlotte, NC: Information Age.

Punch, K. F. (2005). *Introduction to social research: Quantitative and qualitative approaches.* Thousand Oaks, CA: SAGE Publications Inc.

Richlin, L. (2006). *Blueprint for learning: Constructing college course to facilitate, assess, and document learning.* Sterling, VA: Stylus Publishing, LLC.

Rike, C. J., & Sharp, L. K. (2008). Assessing preservice teachers' dispositions: A critical dimension of professional preparation. *Childhood Education, 84*(3), *150-153.*

Ryan, R., & Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78.

Saban, A., Kocbeker, B. N., & Saban, A. (2007). Prospective teachers' conceptions of teaching and learning revealed through metaphor analysis. *Learning and Instruction, 17*(2), 123-139.

Schulte, L., Edick, N., Edwards, S., & Mackiel, D. (2005) The development and validation of the teacher dispositions index. *Essays in Education. 12*(4), 1-16. Retrieved April 30, 2011, from Academic Search Complete database.

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action.* New York, NY: Basic Books.

Schunk, D. (2011). *Learning theories: An educational perspective* (6th ed.). Upper Saddle River, NJ: Pearson.

Sexton, S. S. (2004). Prior teacher experiences informing how post-graduate teacher candidates see teaching and themselves in the role as the teacher. *International Education Journal, 5*(2), 205-214.

Spader, D. (2002). The morality of justice and the morality of care: Are there distinct moral orientations for males and females*? Criminal Justice Review, 27*(1), 66-88.

Stodolsky, S. S., & Grossman, P. L. (2000). Changing students, changing teachers. *Teachers College Record, 102*(1), 125–172.

Su, J. (1992). Sources of influence in teacher candidate socialization. *Journal of Education for Teaching, 18*(3), 239-259.

Taylor, R. L. & Wasicsko, M. M. (2004). The disposition to teach. Paper presented at the American Association of Colleges for Teacher Education conference.

Thayer-Bacon, B.J. (2003). *Transforming critical thinking: Thinking constructively*. New York, NY: Teachers College Press.

Thornton, H. (2006). Dispositions in action: Do dispositions make a difference in practice? *Teacher Education Quarterly, 33*(2), 53-68.

Tschannen-Moran, M., Woolfolk-Hoy, A., & Hoy, W. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research, 68*(2), 202-248.

Turner, N. (2003). Preparing teacher candidates for inclusion in secondary classrooms. *Education, 132*(3), 491-495.

Vgotsky, L. S. (1978). *Mind in society* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Cambridge, MA: Harvard University Press.

Wakefield, A. (1993). Learning styles and learning dispositions in public schools-Some implications of preference. *Education, 113*(3), 402-406.

Wayda, V., &Lund, J. (2005). Assessing dispositions: An unresolved challenge in teacher education. *Journal of Physical Education, Recreation and Dance, 76*(1), 34-41.

Weiner, H., & Cohen, A. (2003). *Dispositions in teacher education programs: An opportunity for reform.* A paper presented at the Second Annual Natiional Conference on Teacher Dispositions, November 19, 2003 at Eastern Kentucky University, Richmond, KY.

Wenzlaff, T. (1998). Dispositions and portfolio development: Is there a connection? *Education, 118*(4), 564-572.

Whitsett, G., Roberson, T., Julian, K., & Beckham, L. (2007). First year teachers' reported levels of functioning on selected professional dispositions. *Education, 128*(1), 95-102.

Wiersma, W., & Jurs, S. G. (2009). *Research methods in education (9th ed.).* Boston, MA: Pearson Education, Inc.

Yin, R. K. (2009). *Case-study research: Design and methods,* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Yob, I. M. (2003). Thinking constructively with metaphors. *Studies in Philosophy & Education, 22*(2), 127-138.

Yung, B. H. (2001). Examiner, policeman or students' companion: Teachers' perceptions of their role in an assessment reform. *Educational Review, 53*(3), 251-260.

APPENDIX A

Interview Questions

Interview Questions

Individual & Focus Group Interview Questions:
Teacher Dispositions & Metaphors of Teaching

- Introduction→Protections→Spiel to four mathematics teachers

1) What life experiences led you to choose teaching as your profession?

2) Think for a moment about your teaching. If you had to define your teaching as a metaphor, what would it be?

3) What kinds of experiences, personally and/or professionally, informed or shaped your teaching metaphor?

4) How do you see this metaphor in your classroom/practice?

5) How is this metaphor reflected in the strategies you use in your classroom?

6) Has your metaphor of teaching changed over time?

7) Do you think about how your dispositions play a role when planning your curriculum? Why or why not? How?

8) Do you see a connection between your teaching metaphor and dispositions? Why or why not? Explain.

9) After this discussion, do you feel like you want to change your metaphor or expand on it? Why or why not? Do you think you will further develop this idea after this discussion? Why or why not?

10) After this discussion, do you feel like you want to expand on your ideas regarding dispositions towards teaching or mathematics? Why or why not? Do you think you will further develop this idea after this discussion? Why or why not?

11) Did anyone say anything during the focus group discussion that made you rethink your own metaphor? Can you explain why what they said make you rethink your metaphor?

12) Do you have any further thoughts you would like to share regarding teaching as metaphor or dispositions beyond what we have discussed thus far?

- Closing, reminder about confidentiality, and a thank you.

APPENDIX B

Consent Form and Google Survey

Survey: Teacher Dispositions Index

Dear Teacher, I am requesting that you participate in an online survey as a part of my dissertation research. Please read the consent form required by my university's Institutional Review Board (IRB), and click on the link below to access the survey electronically. If you do participate, it would be most helpful if you could submit the survey electronically no later than June 3rd, 2011. Thank you, Lorrie Bearden
CONSENT FORM: I agree to participate in the research project entitled Teacher Dispositions: Perceptions vs. Reality which is being conducted by Lorrie O Bearden; a doctoral candidate who is enrolled at Kennesaw State University, Kennesaw, GA 30144. Lorrie O. Bearden is the Principle Investigator. Contact email: lorriebearden@gmail.com; Phone: 404-455-6765; OR Contact Faculty Advisor: Dr. Angela Blaver, 1000 Chastain Road, Kennesaw Hall, Kennesaw, GA 30142. Email ablaver@kennesaw.edu; Phone 678.797.2885. I understand that this participation is voluntary and that the survey will take approximately 15 minutes of my time; I can withdraw my consent at any time and have the results of the participation returned to me, removed from the experimental records, or destroyed. The following points are understood by me: (1)The reason for the research: Lorrie Bearden, a doctoral candidate, has identified pertinent research on dispositions of teachers affecting successful and effective teaching. While reading the research, it was noted that very little is written on assessing dispositions of inservice teachers. Therefore, the research involves me being asked to: a. Complete a survey on professional dispositions of teachers; This research is NOT aimed at analyzing the specific operations of any classroom and/or at assessing individual teaching methodologies. Rather it is aimed at identifying certain teacher dispositions that may influence and/or lead to effective teaching. There are no risks to my person and the only benefits that I may expect from this study are a sense of contributing to the knowledge base in this area. (2)The procedures are as follows: After giving my consent, I will take a survey which is designed to assess teacher dispositions, and understand that the results of my participation will be confidential. (3) Data collected will be handled in a confidential manner (student IDs or any other types of identifiers will be used) and IP addresses WILL NOT be collected by the survey program. (4)The discomforts or stresses that may be faced during this research are: NONE (5)Participation entails the following risks: NONE FORESEEN (6)The results of this participation will be kept confidential and will not be released in any individually identifiable form without my prior consent unless required by law. My name will not be linked in anyway with the results, and any data collected will be destroyed once the dissertation process is completed. (7)Inclusion criteria for participation: Certified High School Teacher PLEASE feel free to print a copy for your records. Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 1000 Chastain Road, #0112, Kennesaw, GA 30144-5591, (678) 797-2268.
* Required

I have read the consent information at the beginning of this survey, and understand that I am participating in confidential doctoral research. I also understand that I may stop taking

the survey at any time without penalty. By checking the box below, I am indicating that I am at least 18 years of age and that I consent to the research. *

- ☐ Yes, I agree.

Gender *

- ○ Male
- ○ Female

Content Area *

- ○ Mathematics
- ○ Language Arts
- ○ Social Studies
- ○ World Languages
- ○ Science
- ○ Other

How many years have you been teaching? * _____

What is your age? * _____

What is your highest degree? *

- ○ Bachelor's Degree
- ○ Master's Degree
- ○ Education Specialist's Degree
- ○ Doctorate

I am committed to critical reflection for my personal growth. * 1-Strongly Disagree 2-DisAgree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I cooperate with colleagues is planning instruction. * 1-Strongly Disagree 2-Disagree 3-Not Sure 4- agree 5-Strongly Agree

1	2	3	4	5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I actively seek out professional growth opportunities. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I stimulate students' interests and encourage self-expression. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I value both long-term and short-term planning. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I stay current with the evolving nature of the teaching profession. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I select material that is relevant for students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I am successful in facilitating learning for all students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I demonstrate and encourage democratic interaction in the classroom and school. * 1-Strongly Disagree 2-Agree 3- Not Sure 4- Disagree 5-Strongly Agree

1 2 3 4 5

Strongly Disagree ○ ○ ○ ○ ○ Strongly Agree

I accurately read the non-verbal communication of students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I engage in dicussions about new ideas in the teaching profession. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I select material that is interesting for students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I provide appropriate feedback to encourage students in their learning and identity development. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I engage in research-based teaching practices. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I create connections to subject matter that are meaningful to students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I listen to colleagues' ideas and suggestions to improve instruction. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I take initiative to promote ethical and responsible professional practice. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I communicate effectively with students, parents, and colleagues. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I work well with others in implementing a common curriculum. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe a teacher must use a variety of instructional strategies to optimize student learning. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I understand that students learn in many different ways. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I demonstrate qualities of humor, empathy, and warmth. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am a thoughtful and responsive listener. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I assume responsibility when working with others. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe that all students can learn. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe it is important to involve all students in learning. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe the classroom environment a teacher creates greatly affects students' learning and development. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I view teaching as an important profession. * 1-Strongly Disagree 2-DIsagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I understand that teachers' expectations impact student learning. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I view teaching as a collaborative effort among educators. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I understand that students have certain needs that must be met before learning can take place. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am sensitive to student differences. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I communicate caring, concern, and a willingness to become involved with others. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am punctual and reliable in my attendance. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I maintain a professional appearance. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe it is my job to create a learning environment that is conducive to the development of students' self-confidence and competence. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I respect cultures of all students and am sensitive to cultural norms. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I honor my commitments. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I treat students with dignity and respect at all times. * 1-Strongly Disagree 2-Disagree 3-Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am willing to receive feedback and assessment of my teaching. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am patient when working with students. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I am open to adjusting and revising my plans to meet student needs. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I communicate in ways that demonstrate respect for the feelings, ideas, and contributions of others. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

I believe it is important to learn about students in their communities. * 1-Strongly Disagree 2-Disagree 3- Not Sure 4- agree 5-Strongly Agree

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Please respond to the following statement, “Teachers should initiate communication to resolve conflicts.”

Please respond to the following statement, “Teachers should demonstrate intellectual and academic curiosity.”

Please respond to the following statement, “Teachers should be proficient in reading, writing, and mathematics."

APPENDIX C

Email Sent To Mathematics Teachers

Hi all,

In addition to my online survey, I am also going to conduct a group interview of math teachers to gain content perspective in my research area. I only need 4-5 participants and I would like a balance of male to female and years of experience (our department ranges from relatively new teacher to over 25 yrs), so please do not feel badly if you decline to participate.

The interview window is between June 13th thru 24th (and will be negotiated once I have my volunteers), would take about an hour, and the results would be confidential. There should be voting buttons at the top of this email, and I will be in touch with those of you who indicate "YES".

Lorrie O. Bearden, Ed.S.
Administrative Assistant
Student Support Team / Section 504
13025 Birmingham Highway
Office Suite 1320
Milton, GA 30004
BeardenL@fultonschools.org
770-740-7000 ext. 152

APPENDIX D

Factor Analysis Table for TDI

Means, Standard Deviations, and t-tests for the TDI Subscales by Gender and Certification Level

Scale	*M*	*SD*	*t*	*df*	*p*
Student-Centered Subscale					
Male (*n*=21)	4.41	0.83			
Female (*n*=84)	4.54	0.70	-0.764	103	.447
Elementary (*n*=50)	4.50	0.90			
Secondary (*n*=30)	4.44	0.68	0.336	78	.738
Professionalism, Curriculum-Centered Subscale					
Male (*n*=21)	4.10	0.86			
Female (*n*=84)	4.09	0.71	0.053	103	.958
Elementary (*n*=50)	4.05	0.86			
Secondary (*n*=30)	4.02	0.73	0.173	78	.863

6.1 Factor Analysis

For the factor analysis part of the final exam, all 8 students indicated that a two-factor solution best fit the data. The first factor had an eigenvalue of 25.97 and accounted for 38.20% of the total variance. The second factor had an eigenvalue of 4.71 and accounted for 6.92% of the total variance. The two factors accounted for approximately 45.12% of the variance in the COE Follow-Up Survey items. When the students considered including a third factor, they found that the third factor had an eigenvalue of 2.60 accounting for 3.83% of the total variance with only three items loading on the factor.

Using a factor loading cutoff value of .50, the students removed 19 of the original 68 items that did not load on either factor. They found that the remaining items measured a knowledge and skills dimension and a dispositions dimension (see Table 1). Thus, the

results of the factor analysis yielded a 49-item COE Follow-Up Survey that measures two unique constructs that encompass all 10 INTASC (1992) principles with items for the knowledge (15 items), skill (20 items), and disposition (14 items) indicators (see Table 1).

When I asked the students to reflect upon the results, they indicated that they were not surprised that the factor analysis clustered the knowledge and skill items together in the dominant factor and the disposition items into the secondary factor. Because the doctoral students are practicing administrators with many years of experience working with teachers, they know that teachers must possess both subject matter knowledge (Shulman 1986) and pedagogical skills (Banks et al. 2005; Grant and Gillette 2006; Leahy, Lyon, Thompson, and Wiliam 2005; LePage et al. 2005; Shepard et al. 2005) to be effective teachers. In addition they realize that teachers' dispositions are the bridge between knowledge and skills that enable teachers to be effective with all students (Grant and Gillette 2006; Sockett 2006). All but one of the skill items and one of the knowledge items loaded on the knowledge and skills factor, and all but three of the disposition items loaded on the dispositions factor. Although the assignment of items to factors based on the factor analysis was not perfect, it was quite impressive given the relationship among knowledge, skills, and dispositions.

Table 1. ***College of Education Follow-Up Survey Items with INTASC Principles and Indicators and Factor Loadings***

College of Education Follow-Up Survey				
Knowledge and Skills Subscale Item	*P*	*I*	*F1*	*F2*
1. I connect students' prior knowledge with current learning.	1	S	.606	.190
2. I develop lessons that engage students in critical thinking and problem solving.	1	S	.550	.280
3. I develop lessons that encourage students to consider ideas from diverse perspectives.	1	S	.591	.125
4. I stimulate students' interests.	1	D	.531	.273
5. I know how to use a variety of instructional strategies that promote student learning.	2	K	.684	.117
6. I know how to adapt my instruction to meet the developmental needs of students.	2	K	.502	.355
7. I understand the connection between physical, social, emotional, moral, and cognitive performance.	2	K	.526	.382
8. I design instruction that meets students' cognitive, social, emotional, moral, and physical needs.	2	S	.662	.332
9. I actively engage all students in learning.	2	S	.522	.457
10. I provide appropriate feedback to encourage students in their development.	2	D	.512	.429
11. I know how to design instruction that helps use students' strengths as the basis for growth.	3	K	.597	.439
12. I understand how students' learning is influenced by	3	K	.540	.271

their culture.				
13. I differentiate instruction to meet individual learning styles/needs.	3	S	.527	.466
14. I understand the cognitive processes associated with various kinds of learning.	4	K	.754	.192
15. I understand the advantages of using a variety of strategies in the teaching-learning process.	4	K	.603	.310
16. I monitor and adjust teaching strategies in response to student feedback.	4	S	.645	.239
17. I present concepts clearly and accurately.	4	S	.504	.486
18. I know a wide range of strategies to promote positive relationships and purposeful learning.	5	K	.572	.474
19. I know how to help students become self-motivated.	5	K	.655	.357
20. I create a classroom environment where students engage in purposeful learning activities.	5	S	.635	.364
21. I effectively use a wide repertoire of classroom management techniques.	5	S	.599	.349
22. I know techniques for effective verbal and nonverbal communication.	6	K	.633	.250
23. I model effective communication strategies.	6	S	.648	.415
24. I use a variety of questioning strategies to stimulate critical thinking and problem solving.	6	S	.586	.203
25. I plan lessons using effective instructional strategies.	7	S	.693	.178
26. I plan activities that promote learning for all students.	7	S	.602	.438
27. I reflect upon the effectiveness of both short-range and long-term plans.	7	S	.588	.473
28. I know how to evaluate students' learning using formative and summative assessments.	8	K	.679	.127
29. I understand assessment related issues, such as reliability, validity, bias, and scoring concerns.	8	K	.595	-.029
30. I use a variety of assessment strategies to measure students' learning.	8	S	.768	.097
31. I use assessment results to evaluate students' progress and modify instruction.	8	S	.705	.074
32. I involve students in self-assessment of their learning.	8	S	.655	.175
33. I effectively communicate students' progress to students, parents, and colleagues.	8	S	.611	.215
34. I understand the impact that self-assessment and reflection have on teaching and learning.	9	K	.536	.212
35. I know how to locate and use best practices.	9	K	.756	.148
36. I engage in research-based teaching practices.	9	D	.545	.365
Dispositions Subscale Item	*P*	*I*	*F1*	*F2*
1. I demonstrate qualities of humor, empathy, and warmth with others.	5	D	.251	.674

2. I treat students with dignity and respect at all times.	5	D	.323	.574
3. I am patient when working with students.	5	D	.389	.531
4. I am a thoughtful and responsive listener.	6	D	.365	.587
5. I assume responsibility when working with others.	7	D	.357	.667
6. I cooperate with colleagues in planning instruction.	7	D	.300	.519
7. I collaborate with my professional colleagues to grow professionally.	9	S	.340	.516
8. I am punctual and reliable in my attendance.	9	D	.041	.789
9. I maintain a professional appearance.	9	D	.003	.861
10. I honor my commitments.	9	D	-.035	.910
11. I am willing to receive feedback and assessment of my teaching.	9	D	.051	.795
12. I uphold the laws and ethical codes governing the teaching profession.	9	D	.013	.762
13. I understand how my school is an organization that operates within the larger community.	10	K	.348	.578

Note. Column P indicates the INTASC (1992) principle represented by the item; Column I indicates the INTASC principle indicator represented by the item, K = Knowledge, S = Skills, D = Dispositions; Column F1 indicates the londing on Factor 1; Column F2 indicates the loading on Factor 2.

APPENDIX E

Interstate New Teachers Assessment and Support Consortium (INTASC) Principles

Interstate New Teachers Assessment and Support Consortium (INTASC) Principles

Principle 1: **Making content meaningful:** The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of subject matter meaningful for students.

Principle 2: **Child development and learning theory:** The teacher understands how children learn and develop and can provide learning opportunities that support their intellectual, social, and personal development.

Principle 3: **Learning styles/diversity:** The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

Principle 4: **Instructional strategies/problem solving:** The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

Principle 5: **Motivation and behavior:** The teacher uses an understanding individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagements in learning, and self-motivation.

Principle 6: **Communication/knowledge:** The teacher uses knowledge of effective verbal, nonverbal and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

Principle 7: **Planning for instruction:** The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

Principle 8: **Assessment:** The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

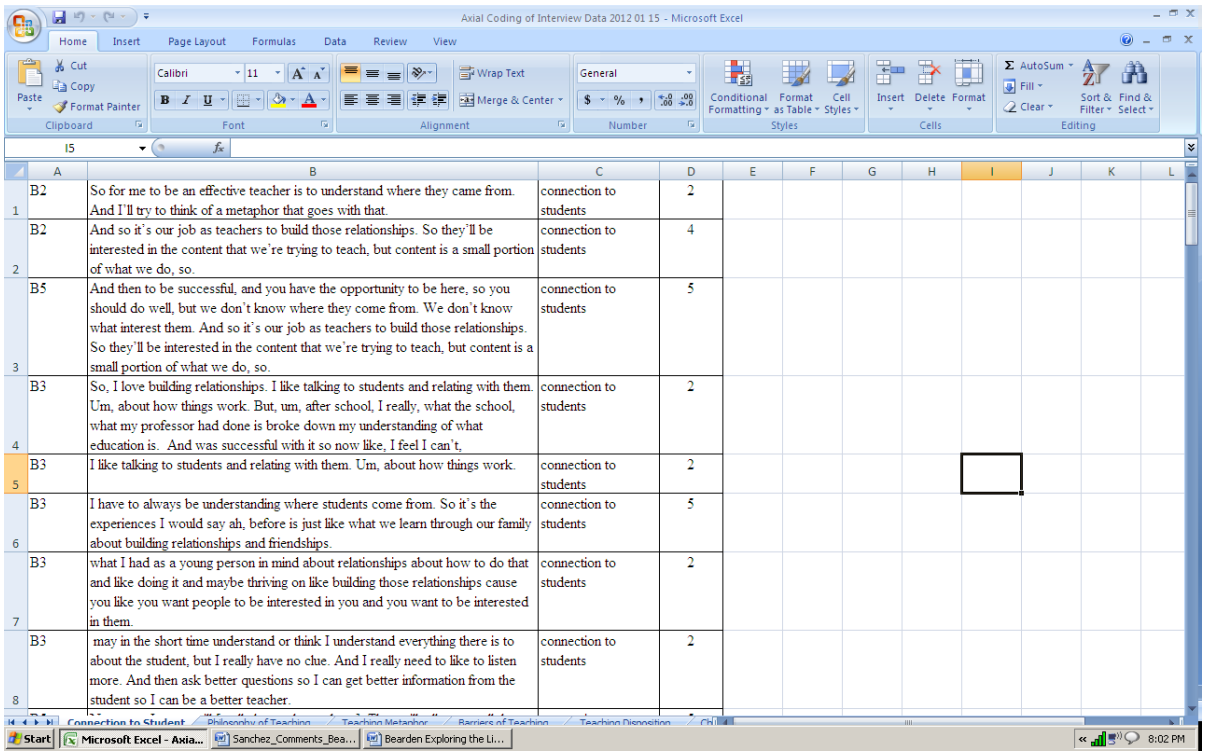
Principle 9: **Professional growth/reflection:** The teacher is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

Principle 10: **Interpersonal relationships:** The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well being.

Retrieved from http://cte.jhu.edu/pds/resources/intasc_principles.htm on October 12

APPENDIX F

Example of Coding Matrix Developed by the Researcher Using Microsoft Excel



	A	B	C	D
1	B2	So for me to be an effective teacher is to understand where they came from. And I'll try to think of a metaphor that goes with that.	connection to students	2
2	B2	And so it's our job as teachers to build those relationships. So they'll be interested in the content that we're trying to teach, but content is a small portion of what we do, so.	connection to students	4
3	B5	And then to be successful, and you have the opportunity to be here, so you should do well, but we don't know where they come from. We don't know what interest them. And so it's our job as teachers to build those relationships. So they'll be interested in the content that we're trying to teach, but content is a small portion of what we do, so.	connection to students	5
4	B3	So, I love building relationships. I like talking to students and relating with them. Um, about how things work. But, um, after school, I really, what the school, what my professor had done is broke down my understanding of what education is. And was successful with it so now like, I feel I can't,	connection to students	2
5	B3	I like talking to students and relating with them. Um, about how things work.	connection to students	2
6	B3	I have to always be understanding where students come from. So it's the experiences I would say ah, before is just like what we learn through our family about building relationships and friendships.	connection to students	5
7	B3	what I had as a young person in mind about relationships about how to do that and like doing it and maybe thriving on like building those relationships cause you like you want people to be interested in you and you want to be interested in them.	connection to students	2
8	B3	may in the short time understand or think I understand everything there is to about the student, but I really have no clue. And I really need to like to listen more. And then ask better questions so I can get better information from the student so I can be a better teacher.	connection to students	2